COURSE UNIT DESCRIPTION

Course unit title	Code
Artificial Intelligence	

Annotation
Conception of Artificial Intelligence, History, directions. Machine learning. Machine learning frameworks. Data clustering and classification. Neural networks and deep learning. Neural network architectures. Recognition tasks using neural networks.

Lecturer(s)	Department, Faculty
Coordinator: Asoc. Prof. Dr. Gintautas Daunys	Siauliai Academy, Višinskio 25, LT-76352, Šiauliai

Study cycle	Type of the course unit
First	Mandatory

Mode of delivery	Semester or period when it is delivered	Language of instruction
Face-to-face	4th semester	Lithuanian and English

Requisites
Prerequisites: Data structures and algorithms, Procedural Programming, Object Oriented Programming.

Number of ECTS credits allocated	Student's workload (total)	Contact hours	Individual work
5	133	56	77

Purpose of the course unit: programme competences to be developed

Purpose of the module – to develop the skills to use artificial intelligence methods for data processing..

Generic competences:

Communication and collaboration *(GK1).*

Life-long learning *(GK2).*

Social responsibility *(GK3).*

Specific competences:

Knowledge and skills of underlying conceptual basis *(SK4).*

Software development knowledge and skills *(SK5).*

Technological and methodological knowledge and skills, professional competence *(SK6).*

Learning outcomes of the course unit	Teaching and learning methods	Assessment methods
Understand the fundamental concepts of machine learning, including neural networks.	Laboratory works, practical assignments, traditional lectures, problem-based teaching, individual reading, analysis of a scientific paper, individual project, writing programs.	Written examination, assignments (laboratory works), writing a report on chosen topic and presentation. Criteria: quality of programs and report; understanding AI.
Understand machine learning algorithms and neural network architectures.		
Use machine learning and deep learning frameworks, apply open source models.		
Choose neural network models for solving practical problems.		

Course content: breakdown of the topics	Contact hours							Individual work: time and assignments	
	Lectures	Tutorials	Seminars	Workshops	Laboratory work	Internship/work	**Contact hours, total**	**Individual work**	**Assignments**
1. Conception of Artificial Intelligence, History, scientific directions, application areas.	2						**2**	**4**	Individual reading. Writing programs individually.
2. Basic concepts of machine learning.	2						**2**	**2**	
3. Regression task. Scikit-learn framework.	2				2		**4**	**4**	Individual reading. Writing programs individually using Scikit-learn.
4. K-neighbors, decision tree, random forest, support vectors machine algorithms.	2				2		**4**	**4**	
5. K-means and hierarchical clustering algorithms.	1				2		**3**	**4**	
6. Dimension reduction methods. Principal component analysis,	1				4		**5**	**4**	
7. Artificial neuron. Multilayer perceptron. Loss. Pytorch framework.	4				4		**8**	**6**	Individual reading. Writing programs individually using Pytorch.
8. Optimizers. Regularization.	2				4		**6**	**6**	
9. Convolutional neural networks. Computer vision.	4				4		**8**	**8**	
10. Processing of time series. Recurrent neural networks.	2				4		**6**	**6**	
11. Natural language processing.	4				2		**6**	**8**	
12. Reinforcement learning.	2						**2**	**5**	Individual reading.
13. Preparation for examination								**16**	
Total	**28**				**28**		**56**	**77**	

Assessment strategy	Weight %	Deadline	Assessment criteria
1. Programming assignments for topics 3-4	10%	Week 6	Assessment by grade in 10 point system. All assignments are obligatory. The cumulative score is calculated only when all interim assignments have been evaluated.
2. Programming assignments for topics 5-6	10%	Week 8	
3. Programming assignments for topics 7-8	10%	Week 10	
4. Programming assignments for topic 9	10 %	Week12	
5. Programming assignments for topics 10-11	10 %	Week14	
6. Examination	50%	During Exam Session	Test with 10 open-ended questions. The value of each question is 1 point.

Author	Publishing year	Title	Issue of a periodical or volume of a publication; pages	Publishing house or internet site
Required reading				
Gavin Hackeling	2017	Mastering Machine Learning with scikit-learn		Packt Publishing, https://www.packtpub.com/product/mastering-machine-learning-with-scikit-learn-second-edition/9781788299879
Ian Goodfellow, Yoshua Bengio, Aaron Courville	2016	Deep Learning		https://www.deeplearningbook.org/
Eli Stevens, Luca Antiga, Thomas Viehmann	2020	Deep Learning with Pytorch		Manning Publications, https://www.manning.com/books/deep-learning-with-pytorch
Recommended reading				
Ivan Vasilev, Daniel Slater, Gianmario Spacagna, Peter Roelants, Valentino Zocca	2019	Python Deep Learning: Exploring deep learning techniques and neural network architectures with Pytorch, Keras, and TensorFlow.		Packt Publishing Ltd
Palanisamy, Praveen.	2018	Hands-On Intelligent Agents with OpenAI Gym: Your guide to developing AI agents using deep reinforcement learning.		Packt Publishing Ltd
Stanford University course website		CS231n. Convolutional Neural Networks for Vision Recognition		https://cs231n.github.io/convolutional-networks/
Stanford University course website	2022	CS234.: Reinforcement Learning Winter 2022		https://web.stanford.edu/class/cs234/modules.html
Dan Jurafsky, James H. Martin		Speech and Language Processing (3rd ed. draft)		https://web.stanford.edu/~jurafsky/slp3/