

**Course name:** Machine learning and artificial intelligence

ECTS	4
Course status	<i>facultative</i>
Course final assessment /evaluation of outcomes	<i>graded credit</i>
Prerequisite	<i>Basic programming skills, basic math</i>

**Main field of study:** *Landscape Architecture, Environmental Engineering, Geodesy, Food Technology*

Educational profile	<i>General academic</i>
Code of studies and education level	<i>bachelor</i>
Semester of studies	<i>summer</i>
Language of instruction	<i>English</i>

**Course offered by:**

Name of faculty offering the course	<i>Faculty of Environment Engineering and Land Surveying</i>
Name of department offering the course	<i>Department of Applied Mathematics</i>
Course coordinator	<i>Prof. Nataliya Shakhovska</i>

**Learning outcomes:**

Symbol of outcome	Description of the learning outcome	Reference to main field of study outcomes	Area symbol*
KNOWLEDGE – student knows and understands:			
ML_K1 ML_K2 ML_K3	classic concepts in the field of machine learning and constructing learning algorithms machine learning models for data regression, classification and clustering problems deep learning methods		
SKILLS – student is able to:			
ML_S1 ML_S2	match the machine learning model to the given problem use existing programming libraries for regression, classification and clustering problems		
SOCIAL COMPETENCIES – student is ready to:			
ML_C1	critical assessment of existing knowledge and continuous expansion of it		

**Teaching contents**

Lectures:		15 hours
Topics	Introduction to machine learning and artificial intelligence Linear and logistic regression Decision trees and ensemble methods (random forest, gradient boosting) k-NN algorithm and support vector machines (SVM) Deep learning techniques Introduction to neural networks Social and ethical responsibility issues in machine learning	
Accomplished learning outcomes	<i>ML_K1, ML_K2, ML_K3, ML_C1</i>	
Means of verification, rules and criteria of assessment	Written homework assignments performed after individual groups of lectures. To pass the lectures, 50% of the points on the homework assignments is required. Percentage contribution to the final grade: 30%.	

	Final grade for the course determined on the basis of the total number of points obtained from lectures and exercises: 51% - 60% grade: 3.0; 61%-70% rating: 3.5; 71%-80% rating: 4.0; 81%-90% rating: 4.5; 91%-100% rating: 5.0.
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Classes:	30 hours
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Topics	<i>Introduction to basic libraries: numpy, sklearn, pandas</i> <i>Data preprocessing: normalization, categoric variable coding</i> <i>Applications of machine learning and artificial intelligence algorithms in regression</i> <i>Applications of machine learning and artificial intelligence algorithms in classification</i> <i>Applications of machine learning and artificial intelligence algorithms in clusterization</i> <i>Natural language processing: sentiment analysis, text generation, text translation</i> <i>Computer Vision: image recognition, object segmentation, face detection</i> <i>Applications in business: recommendation system, risk analysis, process optimization</i>
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Accomplished learning outcomes	ML_S1, ML_S2
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Means of verification, rules and criteria of assessment	Completion of a project task, participation in the discussion and Student's activity. Percentage contribution to the final grade: 70% .
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Field practicals:	... hours
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Topics	
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Accomplished learning outcomes	
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Means of verification, rules and criteria of assessment	
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#### References:

Basic	"Python Machine Learning" by Sebastian Raschka, Vahid Mirjalili "Deep Learning" by Ian Goodfellow, Yoshua Bengio, Aaron Courville
Supplementary	"Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow" by Aurélien Géron

#### Structure of learning outcomes

Area of academic study: R – Agricultural, forestry and veterinary sciences	... ECTS**
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Area of academic study: T – technical sciences	4 ECTS**
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#### Structure of student activity

Contact hours	49	hrs.	2 ECTS**
Including: lectures	15	hrs.	
classes and seminars	30	hrs.	
consultations	2	hrs.	
participation in research		hrs.	
obligatory field trips		hrs.	
participation in examination	2	hrs.	
e-learning		hrs.	ECTS**
student own work	51	hrs.	2 ECTS**

\*Areas of academic study in the fields of: A – the arts; H – humanities; M – medical, sport and health sciences; N – natural sciences; P – biological sciences; R – agricultural, forestry and veterinary sciences; S – social studies; T – engineering and technology

\*\* stated with an accuracy to 0.1 ECTS, where 1 ECTS = 25–30 hours of classes