



OFFICIAL COURSE PROGRAM

Practical AI for Real-World Problem Solving

Date: 15 January 2026, 8:45-17:00

Location: Centre for Cleantech and Biomass Resource Efficiency (CCBRE), Agricultural University Plovdiv, bl. "Mendeleev" 12, BG-4000 Plovdiv

Instructor:

Dr. Hadi Mahdipour, Head of Data Science and AI, Centre for Cleantech and Biomass Resource Efficiency (CCBRE), Agricultural University Plovdiv.

 hadi.mahdipour@au-plovdiv.bg,  <https://ccbren.eu/>

1- Course Description

This course provides a hands-on introduction to Artificial Intelligence and Machine Learning with a strong emphasis on **practical, real-world problem solving**. Participants will learn how AI models are designed, trained, evaluated, and interpreted using Python and real datasets related to sustainability, biomass, waste management, and environmental applications.

The course bridges theory and practice through a combination of conceptual explanations, mathematical intuition, and executable Python notebooks.

2- Learning Outcomes

By the end of the course, participants will be able to:

- Understand core AI, ML, and Deep Learning concepts and their differences
- Prepare, preprocess, and analyze real datasets
- Apply supervised learning methods for regression and classification
- Evaluate and compare machine-learning models
- Apply unsupervised learning techniques for clustering and feature reduction
- Understand reinforcement learning through practical examples
- Design complete, end-to-end ML pipelines for real-world problems

3- Detailed Course Schedule



Time	Session
08:45 – 09:15	Registration & Breakfast
	Session 1 – Foundations & Data Preparation
	<ul style="list-style-type: none">• Introduction to AI, ML, NN, and DL and their differences
09:15 – 10:45	<ul style="list-style-type: none">• Categories of Machine Learning methods• Python installation (Anaconda) and virtual environments• Dataset loading and preprocessing
10:45 – 11:00	Coffee Break
	Session 2 – Supervised Learning I: Regression & Fundamentals
	<ul style="list-style-type: none">• Supervised learning concepts
11:00 – 12:30	<ul style="list-style-type: none">• Regression (linear and non-linear)• Single-variable and multivariable regression• Introduction to classification problems
12:30 – 13:30	Lunch Break
	Session 3 – Supervised Learning II: Classification Methods
	<ul style="list-style-type: none">• Naive Bayes• K-Nearest Neighbors (KNN)• Logistic Regression• Decision Trees• Random Forests• Support Vector Machines (SVM)• Artificial Neural Networks (ANN)
13:30 – 15:00	
15:00 – 15:15	Short Break
	Session 4 – Model Generalization, Unsupervised & Reinforcement Learning
	<ul style="list-style-type: none">• Overfitting and underfitting• Bias-variance tradeoff• Unsupervised learning: K-Means and Fuzzy C-Means clustering• Feature reduction: Principal Component Analysis (PCA)• Reinforcement Learning concepts and Q-learning• Practical demonstrations (Gridworld / Snake)
15:15 – 16:45	
16:45 – 17:00	Certificates of Attendance & Closing Remarks

Note: The final 5 minutes of each session are reserved for Q&A and discussion.



4- Target Audience

- Engineers and researchers
- Graduate and PhD students
- Professionals interested in applied AI
- Decision-makers seeking practical AI insight

Prerequisites:

Basic familiarity with Python is recommended. No prior AI or Machine Learning background is required.

