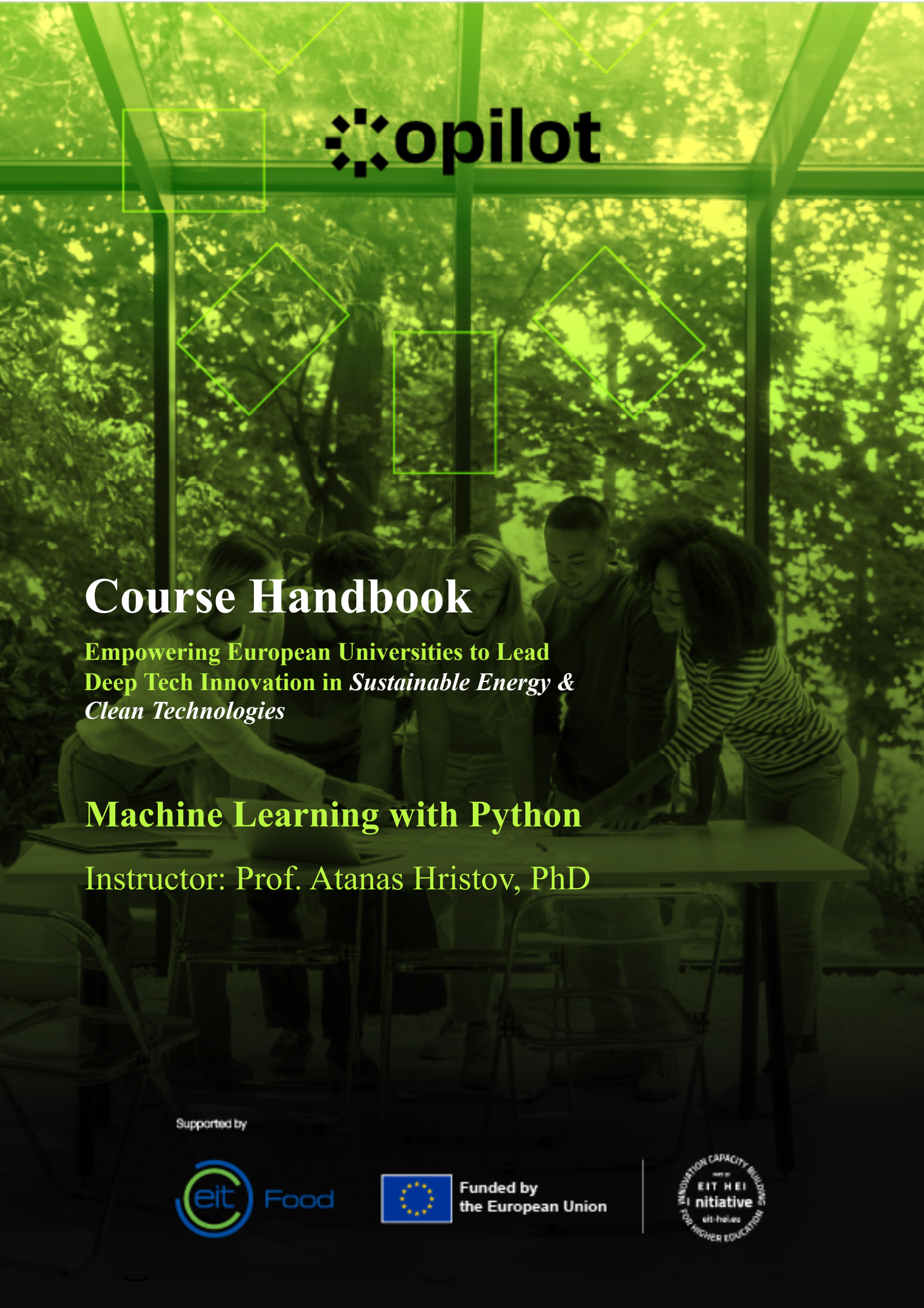


Course Handbook

Empowering European Universities to Lead Deep Tech Innovation in *Sustainable Energy & Clean Technologies*

Machine Learning with Python

Instructor: Prof. Atanas Hristov, PhD

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Course Information

Title: ***Machine Learning with Python***

Instructor: prof. Atanas Hristov, PhD

ECTS credits: 2

Course structure: *5 sessions, 2 lectures + 2 tutorials per session (intensive format)*

Mode of delivery: *online*

Course Summary

This course introduces the concepts, techniques, algorithms, and practical applications of **machine learning by using Python**. During the course, participants will learn how to transform data into meaningful insights through the implementation of modern machine learning algorithms. By combining the theory with hands-on programming sessions, the course will cover the following aspects: data preprocessing, model selection, evaluation, and deployment by using main Python libraries for that purpose.

During the course, participants will be able to:

- Understand the base principles of supervised and unsupervised learning;
- Prepare, clean, and visualize data for machine learning tasks;
- Build, evaluate, and optimize machine learning models;
- Apply feature engineering and model tuning techniques for better performance.

After finishing the course, participants will be able design, implement, and evaluate machine learning solutions using Python. This will enable them to model real-world problems in data analysis, automation, and intelligent decision-making.

Course Participants

This course is designed for a broad audience of **students, researchers, professionals and data scientists** interested in the application of machine learning concepts and methods. The course is open to both **academic and non-academic staff**, encouraging interdisciplinary collaboration between industry and academia.

It is suitable for:

- **Undergraduate and graduate students** in engineering, computer science, data science, or related disciplines.

- **Academic staff and researchers** interested in applying machine learning methods to their scientific or technical domains
- **Industry professionals and technical personnel** interested in predictive modeling and intelligent systems development and aims to integrate machine learning techniques into industrial or research applications.

Learning Outcomes

Upon completion of the course, participants will be able to:

1. Understand the fundamental concepts, algorithms, and applications of machine learning.
2. Prepare, preprocess, and visualize datasets using Python libraries.
3. Implement and evaluate supervised and unsupervised learning models.
4. Apply feature selection, model optimization, and performance evaluation techniques to improve accuracy.
5. Develop and deploy a complete machine learning project in Python for solving real-world problems.

Assessment

In order for each participant to successfully complete the course and be awarded the corresponding ECTS credits, they must pass the course assessment. The outcome of the assessment can be either Pass or Fail. For passing there the participant should achieve 51%. The following distribution maintains a balanced emphasis between conceptual understanding (quiz), practical modeling (assignment), and integrative project-based learning (capstone, report, presentation).

Assessment methods

- Short quiz – 10%
- Technical report – 20%
- Hands-on project development – 30%
- Final project report – 25%
- Oral presentation – 15%

The link between learning objectives and assessment criteria can be seen below.

Learning outcomes	Assessment examples
• Understand the core concepts, types, and applications of machine learning, along with its benefits and limitations.	Short quiz
• Preprocess, clean, and visualize datasets using Python libraries.	Technical report
• Implement and evaluate supervised and unsupervised learning algorithms.	Hands-on project development

• Optimize and fine-tune machine learning models through feature engineering and parameter tuning.	Project presentation
• Design and develop a complete machine learning solution in Python for a real-world problem.	Final project report and oral presentation

Mentoring

In the context of this course, participants will receive personalized mentoring and guidance throughout the learning process. Mentoring will be provided through a combination of one-to-one consultations, small group sessions, and supervised project work.

Bibliography

1. *Géron, A. Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow (3rd ed.). O'Reilly Media, 2022*
2. *Kelleher, J. D., Mac Namee, B., & D'Arcy, A. Fundamentals of Machine Learning for Predictive Data Analytics. MIT Press, 2020*
3. *Raschka, S., Liu, Y., & Mirjalili, V. Machine Learning with PyTorch and Scikit-Learn. Packt Publishing, 2022. Packt product page*
4. *Chollet, F. Deep Learning with Python (2nd ed.). Manning Publications, 2021*
5. *Burkov, A. The Hundred-Page Machine Learning Book. Andriy Burkov (self-published), 2019*
6. *Shalev-Shwartz, S., & Ben-David, S. Understanding Machine Learning: From Theory to Algorithms. Cambridge University Press, 2014*

Other Important Information

Course evaluation: Upon successful completion of the course, participants are required to fill in the course evaluation questionnaire.

Certificate: Upon successful completion of the course, participants will be issued a certificate of achievement provided by UIST and EIT Climate KIC.

Plagiarism: UIST has explicit rules concerning academic dishonesty including plagiarism. Course participants are reminded that all work submitted as part of the requirements for any examination (including coursework) of UIST must be expressed in their own words and incorporated in their own ideas and judgements.

Course Timetable

Session	Date and Time	Instructor	Venue
1st	05.11 2025 @ 17:00	Prof. Atanas Hristov	online
2nd	06.11 2025 @ 17:00	Prof. Atanas Hristov	online
3rd	12. 11 2025 @ 17:00	Prof. Atanas Hristov	online
4th	13.11 2025 @ 17:00	Prof. Atanas Hristov	online
5th	19.11 2025 @ 17:00	Prof. Atanas Hristov	online

Contact Details of Instructor(s)

Name	Email	Telephone number
Prof. Atanas Hristov	atanas.hristov@uist.edu.mk	+38975229463

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