



COURSE DESCRIPTION CARD - SYLLABUS

Course name

Data analysis and machine learning basics in Python [S1ETI2>ADiPNMwJP]

Course

Field of study Education in Technology and Informatics	Year/Semester 3/5
Area of study (specialization) –	Profile of study general academic
Level of study first-cycle	Course offered in Polish
Form of study full-time	Requirements elective

Number of hours

Lecture 15	Laboratory classes 15	Other 0
Tutorials 0	Projects/seminars 0	

Number of credit points

2,00

Coordinators

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Lecturers

Prerequisites

Basic knowledge of programming, mathematics and statistics, ability to solve simple mathematical and technical problems based on existing knowledge, ability to obtain information from indicated sources, understanding of the need for self-education.

Course objective

1. To acquaint students with methods of analyzing and processing data using the Python programming language. 2. To provide students with basic knowledge of selected algorithms of so-called machine learning. 3. To acquaint students with selected examples of practical application of data analysis, machine learning and parametric optimization techniques using the Python language.

Course-related learning outcomes

Knowledge:

1. Student knows the mathematical apparatus necessary to describe and analyze basic issues of materials engineering, technical mechanics and computer science, including the basics of differential and integral calculus, linear algebra, analytical geometry, statistics and numerical methods.
2. Student has basic knowledge of metrology, knows and understands the methods of measuring

physical quantities and analyzing the results.

3. Student has knowledge of procedural, object-oriented programming, artificial intelligence, databases and computer graphics.

Skills:

1. Student is able to obtain information from literature, databases and other sources, integrate it, interpret it and draw conclusions, formulate and justify opinions, as well as prepare and give an oral presentation and documented study on issues related to the field of education in Polish and English .
2. Student can use the acquired mathematical knowledge to describe processes, create models and other activities in the field of materials engineering, mechanics, machine design, electrical engineering, electronics and computer science .
3. Student can identify a technical problem, determine its level of complexity, and propose a plan for its analysis and solution.
4. Student is able to use object-oriented and database programming languages in the field of applications and configuration of IT systems, is able to use software enabling graphical presentation and analysis of experimental results.
5. Student has the ability to self-educate and understands the need for learning throughout professional life.

Social competences:

1. Student understands the need for continuous education (e.g. by participating in courses and postgraduate studies) in order to improve professional and social competences and the need to think and act in an entrepreneurial and innovative way.
2. Student is able to work on a given task independently and cooperate in a team, assuming various roles, demonstrates professionalism and responsibility for decisions made.
3. Student is aware of the social role of a technical university graduate, and especially understands the need to formulate and provide society with information and opinions regarding technical and IT achievements.
4. Student acts in accordance with the principles of professional ethics and is responsible.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

1. Individual project.
- assessment criteria/assessment: in accordance with the study regulations

Programme content

The course syllabus includes the following topics: using version control systems (GIT), using Python for data analysis and processing, and applying machine learning algorithms to analyze selected types of problems.

Course topics

1. Python environment configuration and the GIT version control system.
2. Python language basics.
3. Mathematical operations on data and their visualization.
4. operations on data using the Pandas library.
5. communication with SQL database in Python language.
6. acquisition of data from the Internet.
7. Review and use of selected datasets.
8. Review of selected machine learning algorithms.
9. classification problem.
10. The problem of univariate and multivariate regression.
11. The problem of dimensionality reduction of a dataset.
12. Comparison of supervised and unsupervised learning algorithms.
13. The problem of optimization of algorithm parameters.
14. Review and comparison of selected machine learning libraries for the Python language.

Teaching methods

1. Multimedia presentation - introduction to the implemented topic of laboratory (computer) exercises.
2. Laboratory (computer) exercises - execution of specialized programs, individual work, discussion.
3. Individual student project work, discussion.

Bibliography

Basic:

1. S. Raschka, V. Mirjalili, Python. Uczenie maszynowe, wydanie 2, Helion 2019.
2. A. Saha, Matematyka w Pythonie, Helion 2015.
3. A. Sweigart, Programowanie w Pythonie dla średnio zaawansowanych, Helion 2021.
4. C. Mayer, Kod Pythona w jednym wierszu, Helion 2021.

Additional:

1. M. Sobczyk, Statystyka, PWN 2007.
2. D. J. Rumsey, Statystyka dla bystrzaków, wyd. 2, Helion 2023.

Breakdown of average student's workload

	Hours	ECTS
Total workload	55	2,00
Classes requiring direct contact with the teacher	30	1,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	25	1,00