# COURSE DESCRIPTION CARD - SYLLABUS

Course name
Data analysis and visualization [S2Elmob1-PAiME>AiWD]

## Course

Field of study
Electromobility

Year/Semester
1/2

Area of study (specialization)
Alternative Fuels and Energy Storage

Profile of study
general academic

Level of study
second-cycle

Course offered in
polish

Form of study
full-time

Requirements
compulsory

## Number of hours

Lecture
0

Laboratory classes
15

Other (e.g. online)
0

Tutorials
0

Projects/seminars
0

## Number of credit points

1,00

## Coordinators

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## Lecturers

## Prerequisites

The student starting this course should have a basic knowledge of computer science and numerical methods. The student starting this course should have a basic knowledge of the measurement of electrical and non-electrical electromagnetic devices.

## Course objective

Acquainting with the basic issues and concepts related to the analysis and visualization of data in the field of electrical engineering. Acquiring basic skills necessary for the analysis and processing of measurement signals and their interpretation. Acquiring the ability to use selected computational packages for the analysis and visualization of measurement data. Acquiring the ability to create software that enables data analysis, interpretation and visualization.

## Course-related learning outcomes

Knowledge:

1. The student has a theoretically based knowledge of modern methods of data collection, processing and analysis, also in the field of machine learning.

Skills:
1. The student is able to obtain information (in Polish and English) from various sources, interpret it, critically evaluate it, analyze it and synthesize it, as well as draw conclusions and formulate and justify opinions,
2. The student is able to use modern information and communication tools, advanced programming techniques and machine learning methods when collecting, processing and analyzing data.
3. The student is able to formulate and test hypotheses related to complex engineering problems and simple research problems in the field of electromobility, as well as to interpret the obtained results and draw critical conclusions.

Social competences:
1. The student understands the importance of popularizing the latest achievements in the field of electromobility and the need to fulfill social obligations..

## Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Laboratory: rewarding practical knowledge gained during previous laboratory exercises, checking practical programming skills in Python (final test), assessment of knowledge and skills related to the implementation of individual and group programming projects.
Obtaining additional points for activity during classes, especially for: the ability to cooperate as part of a team practically carrying out a detailed task in the laboratory, the use of elements and techniques that go beyond the material of the lecture and laboratory exercises, aesthetic diligence of completed projects.

## Programme content

Python programming basics, Anaconda system support. Basic Python libraries: NumPy, pandas, Matplotlib, SciPy, Scikit-learn. Data structures, reading and writing data, file formats. Support for arrays and vectors. Operations of joining, binding and transforming data. Charts and data visualization, charts: bar, line, point. Data aggregation and operations performed on groups. Examples of measurement data analysis in the time domain as well as frequency domain.

## Teaching methods

Laboratory: performing laboratory exercises in teams under the supervision of the teacher.

## Bibliography

Basic:
1. W. McKinney, Python w analizie danych. Przetwarzanie danych za pomocą pakietów Pandas i NumPy oraz środowiska IPython. Wydanie II, Helion, 2018
2. W. McKinney, Python for Data Analysis: Data Wrangling with Pandas, NumPy, and IPython, 2nd Edition, William McKinney, 2018
3. M. Gągolewski, A. Cena, M. Bartoszuk: Przetwarzanie i analiza danych w języku Python, Wydawnictwo Naukowe PWN, 2016
4. J. Grus, Data science od podstaw. Analiza danych w Pythonie. Wydanie II, Helion, 2020
5. J. Grus, Data Science from Scratch: First Principles with Python, 2nd Edition, O'Reilly Media, 2019
6. T. P. Zieliński, Cyfrowe przetwarzanie sygnałów. WKŁ Warszawa 2005
7. A. Biernat: Analiza sygnałów diagnostycznych maszyn elektrycznych, Politechnika Warszawska, 2015

Additional:
1. M. Krauss, E. Woschni, Systemy pomiarowo-informacyjne PWN Warszawa 1979

## Breakdown of average student's workload

| | Hours | ECTS |
|---|---|---|
| Total workload | 29 | 1,00 |
| Classes requiring direct contact with the teacher | 15 | 0,50 |
| Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation) | 14 | 0,50 |