COURSE DESCRIPTION CARD - SYLLABUS

Course name
Artificial intelligence in production management [N2ZiIP2>SIwZP]

Course

Field of study
Management and Production Engineering

Year/Semester
2/4

Area of study (specialization)
Quality Engineering and Management

Profile of study
general academic

Level of study
second-cycle

Course offered in
Polish

Form of study
part-time

Requirements
elective

Number of hours

Lecture
8

Laboratory classes
8

Other (e.g. online)
0

Tutorials
0

Projects/seminars
0

Number of credit points

2,00

Coordinators

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Lecturers

Prerequisites

The student has basic knowledge of production management. Has basic skills related to information technologies. Knows the basics of descriptive statistics and probabilistics. Knows what probability density and distribution function are. Is able to use literature (obtaining knowledge from indicated sources) and the Internet.

Course objective

Acquiring knowledge regarding modern data processing and analysis techniques in the context of issues related to production management. Learning the basics of programming in Python and basic data science tools.

Course-related learning outcomes

Knowledge:
The student knows the basic tools used in data mining and analysis.
The student has knowledge of data classification methods and ways of determining the quality of the obtained results
The student knows the basic prediction algorithms and ways of determining the quality of the obtained

results
The student is familiar with the basic artificial intelligence algorithms used in classification and production models

Skills:
The student has the ability to self-educate, including: in order to "improve" professional competences.
The student can visualize data using tools available in Python or other languages.
The student is able to prepare a classification model for prepared input data regarding issues related to production management and determine its quality.
The student is able to prepare a predictive model for prepared input data regarding issues related to production management and determine its quality

Social competences:
The student is aware of the social role of a technical university graduate, and especially understands the need to formulate and convey to society, in particular through the mass media, information and opinions regarding technological achievements and other aspects of engineering activities; makes every effort to convey such information and opinions in a generally understandable manner.
Is aware of the role of "data science" in modern industry and its importance for society and the environment, and is able to define priorities for implementing a specific task in the field of production management.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Written assessment of theory from lectures in the form of a test in electronic and conventional form consisting of 10-15 questions. Ratings: 3.0 <50%;60%), 3.5 <60%;70%), 4.0<70%;80%), 4.5<80%;90%), 5.0 < 90%;100%). Ongoing monitoring of preparation for laboratories, optional final laboratory test in written form. Ratings: 3.0 <50%;60%), 3.5 <60%;70%), 4.0<70%;80%), 4.5<80%;90%), 5.0 <
90%; 100%).

Programme content

Lecture:
1. Introduction to data analysis in production management. Basic data analysis and visualizations.
2. Data classification problem and confusion matrix
3. Linear and non-linear regression, the problem of detecting the point of variability of the system's behavior
4. Decision trees and model quality metrics
5. Neural networks
Laboratory:
1. Introduction to the Jupyter Notebook environment
2. Basics of programming in Python, data import and display
3. Data mining and visualization
4. Detecting anomalies in data
5. Construction of classification models and assessment of the quality of the obtained models

Course topics

1. Data analysis in production management. Basic data analysis and visualizations.
2. Data classification problem and confusion matrix
3. Linear and non-linear regression, the problem of detecting the point of variability of the system's behavior
4. Decision trees and model quality metrics
5. Neural networks

Teaching methods

Lectures and presentations, application examples, case studies (lab)

Bibliography

Basic:
1. Hill R., Berry S., Guide to industrial analytics : solving data science problems for manufacturing and the internet of things, Springer, 2021.
2. Larose D. T., Metody i modele eksploracji danych, Wydawnictwo Naukowe PWN, Warszawa 2022.
3. Morzy T., Eksploracja danych: Metody i algorytmy, Wydawnictwo Naukowe PWN, Warszawa 2023.

Additional:
Kroese D.P. , Botev Z.I. , Taimre T. , Vaisman R., Data Science and Machine Learning: Mathematical and Statistical Methods, Chapman and Hall/CRC, Boca Raton, 2019.

Breakdown of average student's workload

	Hours	ECTS
Total workload	50	2,00
Classes requiring direct contact with the teacher	16	0,50
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	34	1,50