Course Syllabus

<table>
<tr><td colspan="6">Semmelweis University Faculty of Medicine, Faculty of Dentistry, Faculty of Pharmacy, Faculty of Health Sciences, Faculty of Health and Public Administration, András Pető Faculty</td></tr>
<tr><td colspan="5">Course name (Hungarian): Bevezetés a Python programozási nyelv adattudományi alkalmazásaiba
Course name (English): Introduction to Data Science Applications of The Python Programming Language
Course name (German): Einführung in die Anwendung der Programmiersprache Python im Data Science
Course Code in the Neptun System:</td><td>Credit Value:
2 credits</td></tr>
<tr><td rowspan="2">Course Classification:
elective</td><td rowspan="2">Cource Form (credit %)
theory–practice:
0 / 100</td><td colspan="2">Type of Classes:</td><td rowspan="2">Assessment Method:
practical grade</td><td rowspan="2">Semester Offered (frequency):
autumns</td></tr>
<tr><td>Theory:
0</td><td>Practice:
28</td></tr>
<tr><td colspan="6">Prerequisites (Prior Requirements):
• Introduction to The Basics of the Python Programming Language
OR
• Introduction to Information Technology (2) – Programming (EUSZAK006_2M)
OR
• Introduction to Information Technology (2) – Programming (EUSZAK057_3M)
AND
• The course is not open to students enrolled in the Data Science in health MSC program.</td></tr>
<tr><td colspan="6">Course Instructor and Department:
Dr. Tóth, Zoltán, PhD, associate professor, Semmelweis University EKK Institute of Digital Health Sciences
Lecturer:
Dr. Tóth, Zoltán, PhD, associate professor, Semmelweis University EKK Institute of Digital Health Sciences</td></tr>
<tr><td colspan="6">Goal of The Course:
During the course, students gain up-to-date insight into the latest medical and healthcare results in data science and artificial intelligence (AI). The training is practice-oriented: participants acquire the basic problem-solving skills necessary for machine analysis of large amounts of data, while understanding the operating background and practical application possibilities of simpler AI applications.</td></tr>
<tr><td colspan="6">Student enrollment requirements for launching the course: minimum 5 students – maximum 20 students</td></tr>
<tr><td colspan="6">Professional Competencies and Competency Elements:</td></tr>
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A student who completes the course:

- After completing the course, students will be able to independently develop simpler Python codes and implement algorithms suitable for processing and evaluating large amounts of data
- Able to identify and solve fundamental problems that require the analysis of large amounts of data.
- Able to evaluate whether a given health problem can be solved with data science tools.

Detailed Course Topics:

1. Fundamentals of data science and practical applications in medicine and healthcare
2. Fundamentals of the Python language II.: Complex loops, lists, list operations, functions
3. Fundamentals of the Python language III.: Fundamentals of object-oriented programming. Libraries
4. Operations with data and data visualization. Advanced use of the Python Matlib module
5. Biomedical signals and their processing, fundamentals of noise filtering in frequency and time domains
6. Fundamentals of processing and evaluation of health data
7. Data analysis I.: Fitting functions to measurement results, fundamentals of regression
8. Data analysis II.: Optimization procedures
9. Data analysis III.: Time series analysis, trend analysis
10. Fundamentals of machine learning (AI): Distinguishing between supervised and unsupervised learning.
11. Supervised learning principles, simpler algorithms
12. Unsupervised learning: Applying simpler AI models (e.g. K-means clustering) with Python on medical data.
13. Cluster seeking: K-means, nearest neighbor algorithms
14. Homework presentation

Developed The Course Syllabus:

Dr. Tóth, Zoltán, PhD, associate professor, Semmelweis University EKK Institute of Digital Health Sciences

Requirements:

Requirements for attendance and the possibility of making up missed classes, as well as the method of justification in case of absence:

Attendance at least 75% of the practical classes.

Requirement for signature:

Fulfillment of the attendance requirements.

Grading method:

Grading method: Semester assignment on a 5-levels scale

Grade	Low Limit [%]	High Limit [%]
fail (1)	0,00	49,99
pass (2)	50,00	64,99
satisfactory (3)	65,00	79,99
good (4)	80,00	89,99
excellent (5)	90,00	100,00

Number, topics, and schedule of mid-semester assessments (reports, mid-term tests), and possibilities for their make-up and correction::

- 1 individual assignment, submission deadline by the end of week 13. Replacement submission of the semester assignment by the end of week 14.

- The semester assignment is presented in the week following submission.

The use of artificial intelligence solutions during the course is part of the training program.

The use of artificial intelligence during assessments is prohibited, except the task is required it in a note.

Required and recommended literature (notes, textbooks, specialist literature, aids)

- Lecture notes and presentations are available to students in electronic form.
- Perry Xiao: Artificial Intelligence Programming with Python, Wiley, 2022
- Jake VanderPlas: Python Data Science Handbook, O'Reilly Media, 2016
- Wes McKinney: Python for Data Analysis, 3rd edition, O'Reilly Media, 2022
- Prateek Joshi: Artificial Intelligence with Python, Packt Publishing, 2017

Date of the last modification: 2025.