GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Advanced Programming, PG_00044139					
Field of study	Mathematics					
Date of commencement of studies	October 2022		**Academic year of realisation of subject**	2022/2023		
Education level	second-cycle studies		**Subject group**	Optional subject group Subject group related to scientific research in the field of study		
Mode of study	Full-time studies		**Mode of delivery**	at the university		
Year of study	1		**Language of instruction**	Polish		
Semester of study	1		**ECTS credits**	4.0		
Learning profile	general academic profile		**Assessment form**	assessment		
Conducting unit	Instytut Matematyki Stosowanej -> Faculty of Applied Physics and Mathematics					
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. Paweł Pilarczyk				
	Teachers	dr hab. Paweł Pilarczyk dr inż. Paweł Wojda				

Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	0.0	45.0	0.0	0.0	60
	E-learning hours included: 0.0						

Learning activity and number of study hours	Learning activity	Participation in didactic classes included in study plan	Participation in consultation hours	Self-study	SUM
	Number of study hours	60	5.0	35.0	100

Subject objectives	Acquiring the ability to create software in Python at advanced level, including the usage of various software libraries, and applying this ability to solve specific mathematical problems, especially concerned with data analysis.

Learning outcomes	Course outcome	Subject outcome	Method of verification
	K7_W11	Can choose correct algorithms, methods and software libraries for solving specific problems.	[SW1] Assessment of factual knowledge
	K7_W08	Can use Python libraries for processing and visualization of data.	[SW2] Assessment of knowledge contained in presentation
	K7_U13	Can write software in Python. Can create software for solving selected mathematical problems.	[SU1] Assessment of task fulfilment [SU4] Assessment of ability to use methods and tools
	K7_W12	Knows the principles of programming in Python.	[SW1] Assessment of factual knowledge
	K7_K03	Can work on a group software project.	[SK1] Assessment of group work skills

Subject contents	Lecture:
	1. Introduction to programming in Python and to working with Jupyter notebooks.
	2. Built-in data types and syntax of Python.
	3. Data processing: vectors, matrices, data frames, strings. Access to files, Internet resources, and data bases.
	4. Analysis and visualization of data.
	5. Software libraries related to data analysis, for example: NumPy - a library with numerical methods for Python that provides, among others, data structures and methods for working with large and high-dimensional vectors and matrices; SciPy - a library for scientific and technical computations; Pandas - a library for data analysis and manipulation.
	6. Object-oriented programming.
	7. Graphical user interface: Tkinter and PyQt.
	Laboratory: Hands-on experience in creating programs in Python for solving specific problems in the analysis and visualization of data, following the topics dealt with at the lecture.
Prerequisites and co-requisites	Basic programming skills.

Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Tests and quizzes at the lectures	60.0%	50.0%
	Programming projects – laboratory	60.0%	50.0%

Recommended reading	Basic literature	[1] Marek Gągolewski, Maciej Bartoszuk, Anna Cena. Przetwarzanie i analiza danych w języku Python. Wydawnictwo Naukowe PWN, 2016. 400 ss. ISBN: 978-83-01-18940-2 https://ksiegarnia.pwn.pl/Przetwarzanie-i-analiza-danych-w-jezyku-Python,634359876,p.html The textbook is available at the university library, also remotely through IBUK.
	Supplementary literature	[2] Mark Lutz. Learning Python, 5th Edition. https://www.amazon.com/Learning-Python-5th-Mark-Lutz/dp/1449355730 [3] Data Science from Scratch: First Principles with Python, 2nd Edition. https://www.amazon.com/Data-Science-Scratch-Principles-Python-dp-1492041130/dp/1492041130/
	eResources addresses	Adresy na platformie eNauczanie: Zaawansowane Programowanie 2022 - Moodle ID: 22721 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=22721

Example issues/ example questions/ tasks being completed	Text formatting in the Markdown language in a Jupyter notebook.
	Unchangeable data structures in Python.
	Copying objects in Python by value or by reference. Deep copy of a list.
	Crating a DataFrame object and using it.
	Creating various graphs using matplotlib.pyplot.
	Opening a file in different modes, reading and writing, closing the file.
	Generating pseudo-random samples following some distribution using the scipy.stats module.
	Linear regression in Python using the sklearn.linear_model module.
Work placement	Not applicable