Computer programming in geoscience applications
- ***COURSE SYLLABUS***

1.	**Course title:**	
	Computer programming in geoscience applications	
2.	**Lecturer:**	
	Mariusz Majdański	
3.	**Field, type and level of studies, year of study:**	
	Everyone with geophysical focus, first or second year of study	
4.	**Course character:**	
	Lecture with programming classes	
5.	**Teaching method:**	
	Traditional on-site (or hybrid if needed)	
6.	**Language:**	*English*
7.	**Course type and number of hours:**	
	Lecture 10h, classes 20h	
8.	**Estimated load of student's independent work:**	*20h*
9.	**Total workload and number of ECTS points:**	*50 h, 2 ECTS*
10.	**Short description and main focus of the course:**	
	This subject is aimed at student with basic programming experience. It aims to provide students with an understanding of the role computation can play in solving problems in geoscience, especially in seismic applications. The Course format will be strongly shifted toward practical classes, and individual work with codes. *Summary of course content:* - *Introduction to programming languages and coding in linux environment (scripts, awk)* - *Python language syntax. Python interpreter and scripts. Arithmetic operations, if statements, loops, functions* - *Algorithms: e.g. monte carlo, numerical derivation and integration* - *Introduction to inversion theory, objective functions* - *Seismic signal processing: filters, aliasing, correlation, convolution* - *Data visualization* - *Selected geophysical problems: diffusion, wave equation, ray-tracing (optical geometry), fast marching, etc.*	
11.	**References:**	

	1. *Machtelt Garrels, Introduction to Linux, A Hands on Guide* 2. *Internet materials: www.python.org, www.numpy.org, www.scipy.org, matplotlib.org*	
12.	**Prerequisites:** *basic MSC. level course of physics and mathematics*	
13.	**Educational outcomes:**	**PQF level 8 codes:**
	Knowledge: *Student understand:* - *how to solve simple inversion problems* - *how to optimise inversion using iterative and statistical methods*	*P8S_WG*
	Practical Skills: *student know and understand:* - *Basic syntax of Python language including data processing and visualization* - *Knows how to write new and use pre-existing modules with advanced routines and algorithms*	*P8S_UW*
	Social Skills: *student is ready to:* - *Recognize the challenges in solving practical problems related to big data sets* - *Understand importance of the uncertainty analysis in computer sciences and explain those concept to the public*	*P8S_KK*
14.	**Evaluation of the educational outcomes:** *Two tests writing codes + oral exam if needed*	
15.	**Criteria to complete the course:** *More than half points from both tests to pass (3), more points for better grade*	
16.	**Contact with the lecturer:** *Email: mmajd@igf.edu.pl or personal contact in 512A (IG PAS)*	