1.	**Field of study**	**Applied Geology**
2.	Faculty	Faculty of Natural Sciences
3.	Academic year of entry	2020/2021 (summer term), 2021/2022 (summer term), 2022/2023 (summer term), 2023/2024 (summer term), 2024/2025 (summer term)
4.	Level of qualifications/degree	second-cycle studies (in engineering)
5.	Degree profile	general academic
6.	Mode of study	full-time

Module: Natural hazards

Module code: 2GS-737

1. Number of the ECTS credits: 2

2. Learning outcomes of the module

code	description	learning outcomes of the programme	level of competence (scale 1-5)
2GS-737_1	knows definitions of disaster, prediction and forecasting, as well as, their aims and limitations	2GS_K1 2GS_W1 2GS_W2	3 3 3
2GS-737_2	knows the basic laws describing the physical processes occurring on the surface and in the earth interior that generate natural disasters and understands the issue of natural hazard monitoring and their possible limitations of the disasters effects	2GS_W1 2GS_W2 2GS_W3 2GS_W4	5 5 5 5
2GS-737_3	knows forecasting in deterministic and stochastic processes and definitions of extreme events, methods and criteria for assessing natural hazards foracsting	2GS_W1 2GS_W2 2GS_W3 2GS_W4	5 5 5 5
2GS-737_4	knows the causes, course and effects of natural disasters: earthquakes, tsunamis, volcanic eruptions, mass movements, threats related to mining	2GS_W1 2GS_W2	2 2
2GS-737_5	knows computational techniques allowing to estimate the basic quantities characterizing the natural hazards	2GS_U1 2GS_U2 2GS_U3 2GS_U4 2GS_U5	5 5 5 5 5

		2GS_U6 2GS_U9	5 5
2GS-737_6	knows the basic issues of natural hazard statistics and probability	2GS_K2 2GS_W1	2 2
2GS-737_7	can, at the basic level, operate at least one available software package for data interpretation	2GS_U5 2GS_U6	2 2
2GS-737_8	can analyze physical models describing a catastrophic phenomenon	2GS_U5 2GS_U6	2 2

3. Module description	
Description	The Natural hazards module consists of lectures and laboratories during which the student learns about the issues related to forecasting, monitoring and analysis of the effects of natural hazards occurring on the Earth. During the lectures, the student becomes familiar with: - the definition of a catastrophe; definition and objectives of the forecast, evaluation of the size of the catastrophic phenomenon; - issues: system stability, Drucker's postulate and Voight's law; - possibilities and limitations of predicting deterministic and stochastic processes, statistics of random phenomena; - problems of seismic hazard in natural and anthropogenic seismology; - tsunami waves, wave physics, Green's law and tsunami warning systems; - basic models of volcanic eruptions, volcanic eruption index, lahar issues and the possibility of their prevention. Laboratories include computational tasks related to: - forecast of peak ground amplitudes on the surface; - calculation of seismic hazard parameters: the probability of exceedance of the magnitude and mean returning time; - forecast of a strong seismic phenomenon using the Benioff strain acceleration model.
Prerequisites	Knowledge of mathematical analysis, solving systems of equations (many variables), the principles of statistical methods in measurement is required. Moreover, a student has to possess knowledge of the laws of physics in the field of kinematics, waves propagation, as well as, dynamics in geology and tectonics, knowledge of working in a spreadsheet (MS Excel or similar).

4. Assessment of the learning outcomes of the module

code	type	description	learning outcomes of the module
2GS-737_w_1	Examination	The knowledge of the scopes presented in the lectures (module description) and related to additional issues mentioned during the lecture (to be completed by yourself) is required	2GS-737_1, 2GS-737_2, 2GS-737_3, 2GS-737_4, 2GS-737_5, 2GS-737_6, 2GS-737_7, 2GS-737_8
2GS-737_w_2	Report	It includes knowledge of the basic assumptions and measurement methodology needed to perform calculations and forecasts using data interpretation software. The report should demonstrate the ability to use appropriate computational and computer techniques, use professional vocabulary and appropriate terminology, make logical inference and discuss the obtained results, together with a statistical evaluation of the measurement, if required.	2GS-737_1, 2GS-737_2, 2GS-737_3, 2GS-737_4, 2GS-737_5, 2GS-737_6, 2GS-737_7, 2GS-737_8

5. Forms of teaching

code	form of teaching			required hours of student's own work		assessment of the learning outcomes of the module
	type	description (including teaching methods)	number of hours	description	number of hours	
2GS-737_fs_1	lecture	lecture containing the selected basic issues with the use of audiovisual aids, classes in the computer lab, performing exercises with the use of appropriate software	30	supplementary reading, working with the textbook, solving additional exercises, preparation of the report	30	2GS-737_w_1, 2GS-737_w_2