



Hydrological and hydrogeological hazards

Educational subject description sheet

Basic information

Study programme Geohazards and Climate Change		Didactic cycle 2023/24
Speciality -		Subject code 07GCCS.21P.02852.23
Organizational unit Faculty of Geographical and Geological Sciences		Lecture languages English
Study level Second-cycle programme		Course type Obligatory
Study form Full-time		Block Basic subjects
Education profile General academic		
Subject coordinator	Leszek Sobkowiak, Filip Wolny	
Lecturer	Leszek Sobkowiak, Filip Wolny	
Period Semester 1	Activities and hours <ul style="list-style-type: none">Lecture: 15, ExamLaboratories: 15, Graded credit	Number of ECTS points 4

Goals

Code	Goal
C1	Familiarizing the student with the knowledge on hydrological and hydrogeological hazards, and the impacts of natural conditions of various geographical zones on shaping these hazards on different scales.
C2	Developing the ability to assess the importance of environmental conditions and human activities on the watershed, basin and global scales on the occurrence of hydrological and hydrogeological hazards.
C3	Developing the ability to properly interpret the causes and effects of hydrological and hydrogeological hazards on different scales.
C4	Developing the ability to apply appropriate methods of analysis and assessment of hydrological and hydrogeological hazards, their course and magnitude.
C5	Developing the ability to choose the most appropriate adaptation strategies in risk management and mitigation of the consequences of hydrological and hydrogeological hazards on the local and regional scales.

Entry requirements

Proven knowledge and skills in the field of hydrology and water management, hydrogeology, applied hydrology and hydrological processes in the catchment.

Subject learning outcomes

Code	Outcomes in terms of	Learning outcomes	Examination methods
Knowledge - Student:			
W1	understands the influence of the natural environment and human activities on the development of hydrological and hydrogeological hazards on different scales;	GCC_K2_W01, GCC_K2_W04	Written exam, Project
W2	understands an increasing role of hydrological and hydrogeological hazards in shaping the directions of socio-economic development;	GCC_K2_W04, GCC_K2_W05, GCC_K2_W08	Written exam, Project
W3	understands the importance of risk management adaptation strategies in mitigation of the consequences of hydrological and hydrogeological hazards on different scales;	GCC_K2_W09	Written exam, Project
W4	knows the latest scientific achievements related to the course of hydrological and hydrogeological hazards and methods of their control;	GCC_K2_W15, GCC_K2_W17, GCC_K2_W18	Written exam
W5	knows the risks associated with the presence of chemicals currently not regulated under environmental laws in surface and groundwater; understands the sources and fate of such chemicals.	GCC_K2_W18	Written exam, Project
Skills - Student:			
U1	analyzes and interprets the causes and course of hydrological and hydrogeological hazards and predicts their effects based on the obtained knowledge in the field of natural and socio-economic sciences;	GCC_K2_U05, GCC_K2_U07	Project
U2	plans solutions of risk management and mitigating the impacts of hydrological and hydrogeological hazards on the socio-economic development;	GCC_K2_U12, GCC_K2_U13	Project

Code	Outcomes in terms of	Learning outcomes	Examination methods
U3	determines the importance of the geographical features of the catchment, climate change and human activity in shaping the spatio-temporal differentiation of hydrological and hydrogeological hazards in different geographical zones;	GCC_K2_U14	Written exam
U4	applies computer techniques (e.g. GIS software) to resolve problems related to hydrological and hydrogeological hazards.	GCC_K2_U11, GCC_K2_U16	Project
Social competences - Student:			
K1	is prepared to engage in science communication, teaching and campaigns for popularization the knowledge on hydrological and hydrogeological hazards and disaster risk reduction;	GCC_K2_K01, GCC_K2_K02	Project
K2	is prepared to find solutions aiming to mitigate the impacts of hydrological and hydrogeological hazards on the socio-economic development.	GCC_K2_K05, GCC_K2_K07	Project

Study content

No.	Course content	Subject learning outcomes	Activities
1.	Introduction to hydrological and hydrogeological hazards: research subject and tasks.	W1, W4	Lecture
2.	Analysis of the impact of natural conditions and human activities on the course and magnitude of hydrological and hydrogeological hazards.	W1, W5, U1, U3	Lecture
3.	Case studies: hydrological and hydrogeological hazards from the local, regional and global perspectives.	W2, W3, U1, U2, K2	Lecture
4.	The predicted directions of development of hydrological and hydrogeological hazards in the light of latest scientific achievements.	W1, W4, U1, K1, K2	Lecture
5.	Legal aspects of the hydrological and hydrogeological hazards prediction and control.	W3, W5, U2	Laboratories
6.	Sources of information on hydrological and hydrogeological hazards: analysis of the hydrographic maps, the flood hazard maps and the flood risk maps.	W1, W4, U1, K2	Laboratories
7.	Case study: hydrological and hydrogeological risk management.	W4, U2, U4, K2	Laboratories

Additional information

Activities	Teaching and learning methods and activities
Lecture	Lecture with a multimedia presentation of selected issues
Laboratories	Project method

Activities	Credit conditions
Lecture	The final grade consists in 100% of the result obtained in the written exam. Grading scale: 1. very good (bdb; 5.0) - >90% of points, 2. good plus (db plus; 4.5) - >80% of points, 3. good (db; 4.0) - >70% of points, 4. sufficient plus (dst plus; 3.5) - >60% of points, 5. satisfactory (dst; 3.0) - >50% of points, 6. unsatisfactory (ndst; 2.0) - <50% of points.
Laboratories	The final grade consists in 100% of the result obtained on the basis of the implemented project. Grading scale: 1. very good (bdb; 5.0) - >90% of points, 2. good plus (db plus; 4.5) - >80% of points, 3. good (db; 4.0) - >70% of points, 4. sufficient plus (dst plus; 3.5) - >60% of points, 5. satisfactory (dst; 3.0) - >50% of points, 6. unsatisfactory (ndst; 2.0) - <50% of points.

Literature

Obligatory

1. Directive 2007/60/EC of the European Parliament and of the Council on the assessment and management of flood risks.
2. Fetter C.W., 2000. Applied Hydrogeology. Prentice Hall, Upper Saddle River, NJ.
3. IPCC, 2022. Climate Change 2022: Impacts, Adaptation and Vulnerability. Cambridge University Press. Cambridge University Press, Cambridge-New York.
4. Kovacs Y., Doussin N., Gaussens M, 2017. Flood risk and cities in developing countries. Technical Reports, No. 35. ISSN 2492-2838.
5. Kumar A., Burton I., Etkin D. (eds.), 2001. Managing Flood Hazard and Risk: Report of an Independent Expert Panel. Report prepared for Emergency Preparedness Canada and Environment Canada.

Optional

1. Bärenbold F., Boehrer B., Grilli R., Mugisha A., von Tümpling W., et al., 2020. No increasing risk of a limnic eruption at Lake Kivu: Intercomparison study reveals gas concentrations close to steady state. PLOS ONE 15(8): e0237836.
2. Ingham D., Pop. I., 2002. Transport Phenomena in Porous Media II. Elsevier, Burlington, MA.
3. Poehls D.J., Smith G., 2009. Encyclopedic Dictionary of Hydrogeology. Elsevier, Burlington, MA.
4. UNESCO, Intergovernmental Oceanographic Commission, Manuals and Guides 52, 2009. Tsunami Risk Assessment and Mitigation for the Indian Ocean.
5. WHO, 2013. Health risk assessment from the nuclear accident after the 2011 Great East Japan earthquake and tsunami, based on a preliminary dose estimation. ISBN 978-92-4-150513-0.

Calculation of ECTS points

Activities	Activity hours*
Lecture	15
Laboratories	15
Preparation for classes	10
Reading the indicated literature	20

Preparation of a project	30
Preparation for the exam	20
Student workload	Hours 110
Number of ECTS points	ECTS 4

* academic hour = 45 minutes

Efekty uczenia się dla kierunku

Kod	Treść
GCC_K2_K01	The graduate is ready to implement and popularize actions serving the environmental protection
GCC_K2_K02	The graduate is ready to identify the influence of environmental processes onto the socio-economic processes, and also influence of anthropogenic activities onto the various components of the natural environment in various timescales
GCC_K2_K05	The graduate is ready to prioritize in order to successfully complete of the task
GCC_K2_K07	The graduate is ready to undertake the cooperation within the crisis management teams and solve the conflicts
GCC_K2_U05	The graduate can an extended degree use the scientific terminology and vocabulary, read the advanced scientific literature with understanding
GCC_K2_U07	The graduate can look for and select the necessary information from the scientific literature and other written sources and based on that learn and continuously update the knowledge throughout the life
GCC_K2_U11	The graduate can apply mathematical and statistical methods for analysis, interpretation and visualization of the environmental data
GCC_K2_U12	The graduate can apply qualitative methods for solving the human-environment conflicts
GCC_K2_U13	The graduate can use in practice the environmental management principles leading to improvement of quality of life
GCC_K2_U14	The graduate can describe in extended degree environmental components and their relationships
GCC_K2_U16	The graduate can transparently and accessibly present the Earth and environmental sciences topics
GCC_K2_W01	The graduate knows and understands thoroughly, the processes operating in the natural environment, their causes, mechanisms, consequences and associated geohazards
GCC_K2_W04	The graduate knows and understands thoroughly, the role of surface and ground water in the natural environment and the anthropogenic influence on their functioning
GCC_K2_W05	The graduate knows and understands thoroughly, the causes and the evolution of extreme hydro-meteorological events in global, regional and local scale and their influence on the socio-economical processes
GCC_K2_W08	The graduate knows and understands thoroughly, the influence of the climate change, extreme environmental events and geohazards on the socio-economic processes
GCC_K2_W09	The graduate knows and understands thoroughly, relationship between climate and environmental change and necessity of formulation of the adaptation strategies
GCC_K2_W15	The graduate knows and understands advanced vocabulary associated with climate change, natural environment and geohazards
GCC_K2_W17	The graduate knows and understands thoroughly, the literature in the field of climate change, geohazards as well as basic environmental and social research
GCC_K2_W18	The graduate knows and understands thoroughly, the most up to date trends in science and implementation of the newest scientific achievements in studies field