

# Introduction to climate system and contemporary climate change

## Educational subject description sheet

### Basic information

<b>Study programme</b> Geohazards and Climate Change <b>Speciality</b> - <b>Organizational unit</b> Faculty of Geographical and Geological Sciences <b>Study level</b> Second-cycle programme <b>Study form</b> Full-time <b>Education profile</b> General academic		<b>Didactic cycle</b> 2023/24 <b>Subject code</b> 07GCCS.21P.03745.23 <b>Lecture languages</b> English <b>Course type</b> Obligatory <b>Block</b> Basic subjects
<b>Subject coordinator</b>	Bartosz Czernecki	
<b>Lecturer</b>	Bartosz Czernecki	
<b>Period</b> Semester 1	<b>Activities and hours</b> <ul style="list-style-type: none"> <li>Lecture: 30, Exam</li> <li>Laboratories: 15, Graded credit</li> </ul>	<b>Number of ECTS points</b> 4

### Goals

Code	Goal
C1	Providing detailed knowledge at the university level regarding the geoecosystem of the Earth, with particular emphasis on changes in the energy balance of the atmosphere.
C2	Bringing wider awareness of historical, contemporary and future effects of climate change caused by natural and anthropogenic factors.
C3	Addressing the global climate change problem in the multidisciplinary context of adaptation and mitigation policies.

## Entry requirements

Introductory requirements cover general knowledge related to geography, biology, physics and mathematics at the bachelor level.

## Subject learning outcomes

Code	Outcomes in terms of	Learning outcomes	Examination methods
<b>Knowledge - Student:</b>			
W1	knows the basic components and processes that takes place in atmosphere and its interactions to other geospheres;	GCC_K2_W06, GCC_K2_W07, GCC_K2_W15, GCC_K2_W18	Written exam, Written colloquium, Multimedia presentation
W2	knows conflicts between natural and socio-economical components that may appear in environment; broadly explains its reasons and optimal ways of resolving them;	GCC_K2_W01, GCC_K2_W02, GCC_K2_W05, GCC_K2_W06, GCC_K2_W07	Written exam, Written colloquium, Multimedia presentation
W3	understands the need of creating possible future scenarios with the role of modeling solutions for assessing potential changes in environment and its effects for socio-economic actions;	GCC_K2_W01, GCC_K2_W06, GCC_K2_W07, GCC_K2_W08, GCC_K2_W11	Written exam, Written colloquium, Multimedia presentation
W4	knows environmental problems caused by anthropoppression;	GCC_K2_W01, GCC_K2_W02, GCC_K2_W08, GCC_K2_W09	Written exam, Written colloquium, Multimedia presentation
W5	understands and classifies global processes, including global environmental changes and its impact on physical state of different spheres that brings cause-and-effect impacts in natural and socio-economic aspects.	GCC_K2_W01, GCC_K2_W02, GCC_K2_W08, GCC_K2_W09, GCC_K2_W10	Written exam, Written colloquium, Multimedia presentation
<b>Skills - Student:</b>			
U1	uses proper and precise vocabulary used in climate studies together with commonly applied methods to describe processes related to contemporary climate change;	GCC_K2_U01, GCC_K2_U03, GCC_K2_U04, GCC_K2_U05, GCC_K2_U07, GCC_K2_U14, GCC_K2_U17	Written exam, Written colloquium, Multimedia presentation
U2	describes reasons for temporal and spatial differentiation of environmental components, including atmospheric phenomena, impacting socio-cultural and economical aspects.	GCC_K2_U01, GCC_K2_U02, GCC_K2_U03, GCC_K2_U05, GCC_K2_U12, GCC_K2_U13, GCC_K2_U14, GCC_K2_U16	Written exam, Written colloquium, Multimedia presentation
<b>Social competences - Student:</b>			

Code	Outcomes in terms of	Learning outcomes	Examination methods
K1	is aware of importance of bio- and geodiversity for including them in local, regional and global climate-related policies;	GCC_K2_K01, GCC_K2_K02, GCC_K2_K03, GCC_K2_K04, GCC_K2_K05, GCC_K2_K06, GCC_K2_K07, GCC_K2_K08	Written exam, Written colloquium, Multimedia presentation
K2	is prepared to apply common climate-protection rules in order to maintain ecosystem in an unchanged state for next generations.	GCC_K2_K01, GCC_K2_K02, GCC_K2_K03, GCC_K2_K04, GCC_K2_K05, GCC_K2_K06, GCC_K2_K07, GCC_K2_K08	Written exam, Written colloquium, Multimedia presentation

### Study content

No.	Course content	Subject learning outcomes	Activities
1.	Atmosphere and its components. Significance of energy fluxes for state of atmosphere and its balance. 0-dimensional model of energy balance.	W1, W4, W5, U2	Lecture, Laboratories
2.	The role of greenhouse gases in shaping the radiance balance. Greenhouse gases life cycle and its global warming potential.	W2, W3, W4, U1, U2, K1, K2	Lecture, Laboratories
3.	Carbon cycle and its role for climate system.	W1, W2, W4, W5, U1, U2, K1, K2	Lecture, Laboratories
4.	Basics of Global Climate Models and its structure. Climate projections. IPCC Reports.	W2, W3, W4, W5, U1, U2, K1, K2	Lecture, Laboratories
5.	Contemporary effects of climate change in regional and global scale. Attribution of extreme events to climate change. Adaption and mitigation policies in terms of contemporary climate change.	W2, W3, W4, W5, U1, U2, K1, K2	Lecture, Laboratories
6.	Geopolitics on the background of global climate changes and its socio-economic and political consequences.	W2, W3, W4, U2, K1, K2	Lecture

### Additional information

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

Activities	Credit conditions
Lecture	The final grade is based in 100% on a result obtained for the written exam. Grading scale: 1. very good (5,0) – over 90% of points, 2. good+ (4,5) – over 80% of points, 3. good (4,0) – over 70% of points, 4. sufficient+ (3,5) – over 60% of points, 5. sufficient (3,0) – over 50% of points, 6. failing grade (2,0) – below 50% of points.
Laboratories	The final grade is based on a result obtained for the written colloquium (60%) and multimedia presentation (40%) on the chosen topic among predefined list. Grading scale: 1. very good (5,0) – over 90% of points, 2. good+ (4,5) – over 80% of points, 3. good (4,0) – over 70% of points, 4. sufficient+ (3,5) – over 60% of points, 5. sufficient (3,0) – over 50% of points, 6. failing grade (2,0) – below 50% of points.

## Literature

### Obligatory

1. Ahrens C.D., Henson R. 2017. Essentials of Meteorology: An Invitation to the Atmosphere
2. Mann M., 2021. The New Climate War: The Fight to Take Back Our Planet. Public Affairs
3. Valérie Masson-Delmotte et al. 2021 (IPCC 2021). Climate Change 2021. The Physical Science Basis. Working Group I Contribution to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change

### Optional

1. Mehnert, Antonia. 2016. Climate Change Fictions: Representations of Global Warming in American Literature. Palgrave Macmillan
2. Oreskes N., Conway E.M. 2010. Merchants of Doubt. How a Handful of Scientists Obscured the Truth on Issues from Tobacco Smoke to Global Warming. Bloomsbury Press

## Calculation of ECTS points

Activities	Activity hours*
Lecture	30
Laboratories	15
Reading the indicated literature	15
Preparation for classes	10
Preparation for the assessment	5
Preparation for the exam	30
Preparation of a multimedia presentation	15
<b>Student workload</b>	<b>Hours</b> 120

<b>Number of ECTS points</b>	<b>ECTS</b> 4
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\* 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_K03	The graduate is ready to communicate, discuss and argue burning issues, hazards and problems associated with the climate, climate and environment changes for wider, non-scientific audience
GCC_K2_K04	The graduate is ready to use reliable sources of information associated with environmental hazards and climate and critical assessments of these sources
GCC_K2_K05	The graduate is ready to prioritize in order to successfully complete of the task
GCC_K2_K06	The graduate is ready to think and act creatively
GCC_K2_K07	The graduate is ready to undertake the cooperation within the crisis management teams and solve the conflicts
GCC_K2_K08	The graduate is ready to take the responsibility for health and safety and the entrusted equipment
GCC_K2_U01	The graduate can vary between natural and anthropogenic causes of climate change and associated environmental changes and geohazards
GCC_K2_U02	The graduate can critically assess future climate change scenarios and associated environmental changes and geohazards
GCC_K2_U03	The graduate can conclude based on the data and information from various sources and geographical and environmental information
GCC_K2_U04	The graduate can formulate the research hypotheses and conduct environmental research: to plan, to manage and to document
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_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_U17	The graduate can cooperate in the team, efficiently plan the work for her/himself and the research/task team
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_W02	The graduate knows and understands thoroughly, climate functioning and mechanisms of atmospheric processes and the anthropogenic influence on the climate
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_W06	The graduate knows and understands thoroughly climatic changeability in various time-scales (yearly, decadal, centennial and millennial) and its causes

<b>Kod</b>	<b>Treść</b>
GCC_K2_W07	The graduate knows and understands thoroughly complex socio-economic processes in the local, regional and global scale and their influence on the occurrence of extreme environmental events
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_W10	The graduate knows and understands thoroughly, the statistical and mathematical tools and methods necessary for the description and interpretation of environmental processes and forecasting environmental changes
GCC_K2_W11	The graduate knows and understands advanced laboratory methods and techniques used in the research on the elements of the environment and the environmental processes
GCC_K2_W15	The graduate knows and understands advanced vocabulary associated with climate change, natural environment and geohazards
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