

Course name: Contemporary Climate Change – the causes, effects, adaptation

ECTS	6.0
Course status	facultative
Course final assessment /evaluation of outcomes	Graded credit
Prerequisite	Basic knowledge and skills in meteorology and climatology

Main field of study: Environmental Engineering

Educational profile	General academic
Code of studies and education level	master of thesis
Semester of studies	winter or summer
Language of instruction	English

Course offered by:

Name of faculty offering the course	Environmental Engineering and Land Surveying
Name of department offering the course	Ecology, Climatology and Air Protection
Course coordinator	Agnieszka Ziernicka-Wojtaszek, Ph.D.

Learning outcomes:

Symbol of outcome	Description of the learning outcome	Reference to main field of study outcomes	Area symbol*
KNOWLEDGE – student knows and understands:			
CLC_K1	basic knowledge of the causes, manifestations and effects of present-day climate change.	IS2_W10	T
CLC_K2	the effects of present-day climate change on global and local scales.	IS2_W10 IS2_W03	T
SKILLS – student is able to:			
CLC_S1	apply the statistical methods he or she is familiar with to describe climate change.	IS2_U02	T
CLC_S2	formulate recommendations for the practice of agricultural engineering with regard to the prevention of, and adaptation to manifestations of the observed air temperature increase and the increased frequency of extreme meteorological phenomena.	IS2_U05	T
SOCIAL COMPETENCIES – student is ready to:			
CLC_C1	work in a team and think creatively while organizing field research.	IS2_K02	T
CLC_C2	understands the need to raise his or her qualifications constantly in the light of both: the climate change taking place and the need to protect the climate.	IS2_K01 IS2_K04	T

Teaching contents

Lectures:	15 hours
Topics	1. The development of the notions and definitions of climate. 2. Climate change and climate variability.

	<ol style="list-style-type: none"> 3. <i>The past and present-day climate change.</i> 4. <i>Natural and human induced climate change.</i> 5. <i>Thermal manifestations of present-day climate change.</i> 6. <i>The changes of other meteorological elements, indicators and meteorological phenomena.</i> 7. <i>Climate extremes.</i> 8. <i>Projections of future climate change, IPCC reports, climate forecasts and climate change extrapolation, the modeling of climate.</i> 9. <i>The ecological effects of present-day climate change, the changes in hydrological processes, the cryosphere, sea level rise.</i> 10. <i>Climate change and its impact on water resources and water management.</i> 11. <i>The impact of climate change on agriculture.</i> 12. <i>The impact of climate change on settlement in coastal areas.</i> 13. <i>The social consequences of climate change.</i> 14. <i>The prevention of, and adaptation to climate change.</i> 15. <i>Climate policies.</i>
Accomplished learning outcomes	CLC_K1; CLC_K2; CLC_C1; CLC_C2
Means of verification, rules and criteria of assessment	Single-choice test, positive assessment should be given at least 50% of correct answers to given questions: <50% – insufficient (2.0); 50–60% – sufficient (3.0); 61–70% – satisfactory plus (3,5); 71–80% – good (4.0); 81–90% – good plus (4,5); 91–100% – very good (5.0). The share of the lecture grade in the final grade is 50%.
Classes:	30 hours
Topics	<ol style="list-style-type: none"> 1. <i>The Macro – processes and the processes taking place in the atmosphere, atmospheric processes and phenomena, the weather, meteorological elements, the relations and interdependencies among meteorological elements, the climate, climatic factors, the dependence of the values of elements of climate on climatic factors, climate indicators and basic statistical characteristics of the climate.</i> 2. <i>The homogeneity of observation stretches as a condition for the detection of climate change.</i> 3. <i>A selection of published materials and meteorological studies on the special diversity of the climate of: Poland, the Carpathian Mountains, the area near Cracow, or Cracow itself. A critical evaluation in the light of the climate change taking place.</i> 4. <i>Statistical measurements of the variability of selected meteorological elements. The classification of temperature and precipitation deviations from the norm, in the light of the climate change taking place.</i> 5. <i>The changes of air temperature observed in Poland and some of their consequences.</i> 6. <i>The mezoclimatic diversity of mountain areas in the light of global warming.</i> 7. <i>Climate change vs precipitation, and water resources in Poland.</i> 8. <i>The change, variability and agricultural effectiveness of precipitation in the light of global warming.</i> 9. <i>The possibilities of cultivating stenothermal plants, the possibilities of cultivating stenothermal plants.</i> 10. <i>The chances and sources of threats to recreation areas in the country in the light of both: the climate change taking place and the one expected.</i> 11. <i>The biometeorological conditions and global warming.</i> 12. <i>The urban heat island, vs global warming.</i>

	<p>13. <i>The modeling of thermal and pluviothermal regionalizations of the area of Poland in the light of the climate change taking place.</i></p> <p>14. <i>The prevention of climate change.</i></p> <p>15. <i>Adaptation to climate change, and its impact on sectors and areas susceptible to climate change.</i></p>
Accomplished learning outcomes	CLC_S1; CLC_S2
Means of verification, rules and criteria of assessment	Passing reports on exercises – a grade from exercises is an arithmetic average of formative grades. The share of the grade for the project exercises in the final grade of the subject is 50%.

References:

Basic	<ol style="list-style-type: none"> 1. Bonan G. 2016. <i>Ecological Climatology. Concepts and Applications</i>. Cambridge University Press, pp. 692. 2. Cowie J. 2007. <i>Climate Change. Biological and Human Aspects</i>. Cambridge University Press, pp. 504. 3. Dessler A.E. 2012. <i>Introduction to Modern Climate Change</i>. Cambridge University Press, pp. 238.
Supplementary	<ol style="list-style-type: none"> 1. <i>Fifth Assessment Report – Climate Change 2013 – IPCC</i>. 2. Houghton J.T. 2004. <i>Global warming</i>. Cambridge University Press, pp. 457. 3. Neelin J., D. 2011. <i>Climate Change and Climate Modeling</i>. Cambridge University Press, pp. 304. 4. Newell P., Paterson M. 2010. <i>Climate Capitalism</i>. Cambridge University Press, pp. 205. 5. Ziernicka-Wojtaszek A., Zawora P., Sarna T., Zawora T. 2010. <i>Estimated changes of pluvio-thermal coefficient in Poland in the light of climatic changes. Environmental Engineering III, Taylor & Francis, 2010, 557–560, ISBN 978-0-415-54882-3</i>. 6. Ziernicka-Wojtaszek A. 2017. <i>The verification of the pluvio-thermal regionalizations of the climate</i>. LAP LAMBERT Academic Publishing, 52, ISBN 978-3-330-05314-4, [3330053143]. 7. Ziernicka-Wojtaszek A. 2020. <i>Pluviothermal regionalization of Poland in light of present-day climate change. Polish Journal of Environmental Studies, 29, 1 (2020), 1–8</i>.

Structure of learning outcomes

Area of academic study: R – Agricultural, forestry and veterinary sciences	0.0 ECTS **
Area of academic study: T – technical sciences	6.0 ECTS**

Structure of student activity

Contact hours	57	hrs.	2.3 ECTS**
Including: lectures	15	hrs.	
classes and seminars	30	hrs.	
consultations	10	hrs.	
participation in research	0	hrs.	
obligatory traineeships	0	hrs.	
participation in examination	2	hrs.	
e-learning	0	hrs.	0.0 ECTS**
student own work	93	hrs.	3.7 ECTS**

*Areas of academic study in the fields of: A – the arts; H – humanities; M – medical, sport and health sciences; N – natural sciences; P – biological sciences; R – agricultural, forestry and veterinary sciences; S – social studies; T – engineering and technology

** stated with an accuracy to 0.1 ECTS, where 1 ECTS = 25–30 hours of classes