University of Gdańsk

Subject card

Subject name and code	Synoptic climatology (Lecture), PG_00196140		
Field of study	Physical geography and geoinformation		
Date of commencement of studies	October 2026	Academic year of realisation of subject	2026/2027
Education level	Master's studies	Subject group	Obligatory subject group in the field of study Subject group related to scientific research in the field of study
Mode of study	full-time studies	Mode of delivery	at the university
Year of study	1	Language of instruction	Polish
Semester of study	2	ECTS credits	2.0
Learning profile	academic	Assessment form	exam
Conducting unit	Climate Research Laboratory -> Department of Physical Oceanography and Climate Research -> Faculty of Oceanography and Geography -> Rector		
Name and surname of lecturer (lecturers)	Subject supervisor	prof. dr hab. Mirosław Miętus	
	Teachers		

Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	0.0	0.0	0.0	0.0	15
	E-learning hours included: 0.0						

Learning activity and number of study hours	Learning activity	Participation in didactic classes included in study plan	Participation in consultation hours	Self-study	SUM
	Number of study hours	15	1.0	34.0	50

Subject objectives
Explanation of the concept of statistical climatology. Methods of traditional synoptic climatology (circulation indices, typologies). Introduction to quantitative methods of synoptic analysis (EOF, CCA, RDA) and their interpretation. Determination of the role of regional atmospheric circulation in shaping local climatic and oceanographic conditions.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[GFGMU2_U04] is able to analyse and interpret the causes and course of physical-geographical processes and phenomena, selects and applies advanced research methods and tools, including statistical and geoinformatics methods, and critically interprets the results obtained, drawing conclusions and formulating their own position on that basis, justified in debate.	Student is able to describe and analyze the causes and course of atmospheric processes and phenomena, skillfully selecting and applying research techniques and tools from the field of statistical methods, interpreting the results obtained as a consequence, and then using theoretical knowledge to formulate their own opinions and conclusions.	[SU1] oral statement/conversation/ discussion [SU4] test/exam - oral or written
[GFGMU2_W02] knows and understands to a deepened extent issues in the field of exact sciences enabling the understanding of complex processes and phenomena occurring in the Earth's natural environment, and in their interpretations consistently relay on empirical foundations, using qualitative and quantitative methods	Student knows and understands the issues in the field of atmospheric dynamics with particular emphasis on geophysics allowing to understand the complex processes and phenomena occurring in the Earth's atmosphere, their essence, genesis and possible consequences, manifested, among other things, by the influence of atmospheric circulation on the variability of climatic and oceanographic conditions.	[SW4] test/exam - oral or written [SW1] oral statement/ conversation/discussion
[GFGMU2_K01] is ready to critically assess the knowledge obtained in the field of Earth and environmental sciences, particularly physical geography and geoinformation, its completion and verification through further critical analysis of scientific literature	Student is ready to critically evaluate his knowledge of the temporal and spatial relationships of atmospheric processes and phenomena, to supplement it and to verify his knowledge and skills through critical reading of the literature on the subject.	[SK1] oral statement/conversation/ discussion [SK4] test/exam - oral or written
[GFGMU2_U02] is able to precisely and appropriately use terminology in the field of physical geography and geoinformation in oral statements and written works	Student is able to proficiently and appropriately apply the terminology of synoptic climatology in oral statements and written works.	[SU1] oral statement/conversation/ discussion [SU4] test/exam - oral or written

Subject contents

1. Theoretical foundations of synoptic climatology: multidimensional functions, gradient.
2. Physical description of particle motion: advection, particle trajectories, scale analysis, hydrostatic and geostrophic equilibrium, thermal wind.
3. Elements of synoptic meteorology: synoptic analysis, air masses, atmospheric fronts, pressure systems.
4. Classification systems for atmospheric circulation patterns.
5. Eigenvectors and their interpretation, canonical analysis (CCA) and redundancy analysis (RDA).
6. Case studies.

Prerequisites and co-requisites

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Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
obtaining a passing grade on the written test	51.0%	100.0%

Recommended reading

Basic literature

Holton, J., 2004, An introduction to dynamic meteorology, Elsevier, Amsterdam.

Yarnal B., 1994, Synoptic climatology in environmental analysis. A primer. Wiley, 256pp.

Yarnal, Brent et al., 2001, Development and Prospects in Synoptic Climatology. International Journal of Climatology 21: 19231950.

Zwieriew, A., 1965, Meteorologia synoptyczna, WKiŁ, Warszawa.

	Supplementary literature	Barry R.G., Carelton A.M., 2001, Synoptic and Dynamic Climatology, Routledge. Bluestein, H., 1992-1993, Synoptic-dynamic meteorology In midlatitudes. Vol. I, II, Cambridge University Press, Cambridge. Marosz M., Wójcik R.,Pilarski M., Miętus M., 2013, Extreme daily precipitation totals in Poland during summer: the role of regional atmospheric circulation, Climate Research, Vol. 56: 245259, 2013, doi: 10.3354/cr01155. Miętus M., Filipiak J., Wojtkiewicz A., Malik P., Jakusik E., 2008, Warunki termiczne na obszarze Polski w świetle modelu statystyczno-empirycznego [w:] M. Miętus (red.) Statystyczno-empiryczny model warunków termicznych w Polsce, Monografie, Instytut Meteorologii i Gospodarki Wodnej, s. 9-65. Pettersen, S., 1956, Weather analysis and forecasting.Vol. I, II., McGraw-Hill, New York. WMO, 1975. Compendium of meteorology: Vol. I, Part I: Dynamic Meteorology, WMO No. 364, Genewa. WMO, 1978. Compendium of meteorology: Vol. I, Part III: Synoptic Meteorology, WMO No. 364, Genewa.
	eResources addresses	
Example issues/ example questions/ tasks being completed	Interpret a given eigenvector (EOF), e.g., a regional atmospheric pressure field. Interpret a pair of canonical maps (CCA), e.g., between a regional atmospheric pressure field and sea level changes on the Polish coast.	
Work placement	Not applicable	

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