AGH UNIVERSITY OF SCIENCE AND TECHNOLOGY

Module name: Atmospheric Investigations

Academic year: 2015/2016 Code: BGF-2-202-AG-s ECTS credits: 3

Faculty of: Geology, Geophysics and Environmental Protection

Field of study: Geophysics Specialty: Applied Geophysics

Study level: Second-cycle studies Form and type of study: Full-time studies

Lecture language: English Profile of education: Academic (A) Semester: 2

Course homepage: —

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Description of learning outcomes for module

MLO code	Student after module completion has the knowledge/ knows how to/is able to	Connections with FLO	Method of learning outcomes verification (form of completion)
Social competence			
M_K001	Student potrafi konstruktywnie współpracować w zespole wykonującym ćwiczenia laboratoryjne i przygotowującym prezentacje	GF2A_K02, GF2A_K03	Presentation
Skills			
M_U001	Student potrafi przeprowadzić pomiary wybranych parametrów atmosfery z wykorzystaniem poznanych metod analitycznych	GF2A_U08, GF2A_U01, GF2A_K03	Activity during classes, Test, Execution of laboratory classes
M_U002	Student potrafi skonstruować prosty model radiacyjny atmosfery planetarnej	GF2A_U02, GF2A_U01	Execution of laboratory classes
M_U003	Student potrafi przygotować i wygłosić prezentację na zadany temat związany z tematyką wykładu	GF2A_U16, GF2A_U18	Presentation
Knowledge			
M_W001	Student posiada wiedzę o strukturze, składzie, funkcjonowaniu i roli współczesnej atmosfery w globalnym ekosystemie Ziemi	GF2A_W02, GF2A_W04, GF2A_W01	Test

M_W002	Student rozumie podstawowe procesy i mechanizmy kontrolujące klimat na Ziemi w skali regionalnej i globalnej	GF2A_W07, GF2A_W01, GF2A_W03	Test
M_W003	Student zna podstawy metodyczne i urządzenia wykorzystywane przy monitoringu składu atmosfery Ziemi	GF2A_U08, GF2A_W06, GF2A_W10	Test, Execution of laboratory classes

FLO matrix in relation to forms of classes

MLO code	Student after module completion has the knowledge/ knows how to/is able to	Form of classes										
		Lectures	Auditorium classes	Laboratory classes	Project classes	Conversation seminar	Seminar classes	Practical classes	Fieldwork classes	Workshops	Others	E-learning
Social competence												
M_K001	Student potrafi konstruktywnie współpracować w zespole wykonującym ćwiczenia laboratoryjne i przygotowującym prezentacje	-	-	+	-	-	+	-	-	-	-	-
Skills												
M_U001	Student potrafi przeprowadzić pomiary wybranych parametrów atmosfery z wykorzystaniem poznanych metod analitycznych	-	-	+	-	-	-	-	-	-	-	-
M_U002	Student potrafi skonstruować prosty model radiacyjny atmosfery planetarnej	-	-	+	-	-	-	-	-	-	-	-
M_U003	Student potrafi przygotować i wygłosić prezentację na zadany temat związany z tematyką wykładu	-	-	-	-	-	+	-	-	-	-	-
Knowledge												
M_W001	Student posiada wiedzę o strukturze, składzie, funkcjonowaniu i roli współczesnej atmosfery w globalnym ekosystemie Ziemi	+	-	-	-	-	+	-	-	-	-	-
M_W002	Student rozumie podstawowe procesy i mechanizmy kontrolujące klimat na Ziemi w skali regionalnej i globalnej	+	-	-	-	-	+	-	-	-	-	-
M_W003	Student zna podstawy metodyczne i urządzenia wykorzystywane przy monitoringu składu atmosfery Ziemi	+	-	+	-	-	+	-	-	-	-	-

Module content

Lectures

1. Origin and evolution of Earth’s atmosphere on geological timescales; evolution of oxygen in Earth’s atmosphere; atmospheres of other planets of the Solar System (2h).
2. Composition, structure and basic parameters of contemporary Earth’s atmosphere; static of the atmosphere; atmosphere as important component of the global ecosystem (2h).
3. Dynamics of the Earth’s atmosphere; forces acting in the atmosphere; types of air motion in the atmosphere; water in the atmosphere; formation of precipitation; dynamic equilibrium in the atmosphere (3h).
4. Changes in the composition of Earth’s atmosphere on different time scales; methods of reconstructing composition of Earth’s atmosphere in the past, based on environmental archives; changes in the composition of Earth’s atmosphere resulting from anthropogenic activities (3h).
5. Fundamentals of radiation physics; transport of radiation in the Earth’s atmosphere; radiation budget of the earth-atmosphere system; role of aerosols in radiation budget; physical mechanisms of greenhouse effect; natural and anthropogenic greenhouse effect (3h).
6. Fundamentals of transport processes in the Earth’s atmosphere (2h)
7. Global and regional climate changes; modelling of climate changes (4h) .
8. Review of analytical methods related to measurements of physical parameters and composition of the Earth’s atmosphere (1h)

Laboratory classes

L1. Fundamentals of gas chromatography:
Determination of CO2 concentration in breath tests using chromatograph SRI and TCD detector.
- sampling,
- calibration of measurements using dilution of standard gases,
- identification of chromatography peaks representing the measured gas
- calculation of CO2 concentrations
- assessment of measurement uncertainty

L2. Modelling of parameters and processes in the atmosphere (computer laboratory)
- modelling of vertical profiles of temperature, pressure and density of the atmosphere
- simple radiation balance models of Earth and other planets

L3. Monitoring of greenhouse gases in the atmosphere – visit to the high-mountain station (KASLAB, Kasprowy Wierch, Tatra Mountains) measuring concentrations of major greenhouse gases in the atmosphere.
- description of synoptic situation at the time of ascent to the Kasprowy Wierch station
- changes of physical parameters of the atmosphere with elevation

Seminar classes

Preparing and presenting a seminar on the subject related to the scope of the course. Work in 2-person teams. The seminar will be held during the second half of the semester, after the lectures are finished.

Method of calculating the final grade

The final mark is composed of partial assessments of student’s performance during implementation of the laboratory classes (L), the seminar (S) and the written exam verifying the knowledge acquired during the course (W).
The final mark (OK) is calculated as a weighted mean:
OK = 0.4xL+0.3xS+0.3xW

Prerequisites and additional requirements
None

Recommended literature and teaching resources
1. E. Boeker, R. v. Grondelle, Environmental Physics, John Wiley & Sons, 1999.
2. D. G. Andrews, An Introduction to Atmospheric Physics, Cambridge University Press, 2000
3. J.P. Peixoto, A.H. Oort, Physics of Climate, Springer, 2007.
4. Climate Change 2007 – The Physical Science Basis, Contribution of Working Group I to the Fourth Assessment Report of the IPCC, Cambridge University Press, 2007.
5. C.F. Bohren, E.E. Clothiaux, Fundamentals of Atmospheric Radiation, WILEY-VCH, 2006.

Scientific publications of module course instructors related to the topic of the module
Additional scientific publications not specified

Additional information
None

Student workload (ECTS credits balance)

Student activity form	Student workload
Participation in lectures	18 h
Participation in laboratory classes	14 h
Participation in seminar classes	10 h
Preparation for classes	40 h
Summary student workload	82 h
Module ECTS credits	3 ECTS