AGH UNIVERSITY OF SCIENCE AND TECHNOLOGY

Module name: Air Pollution

Academic year: 2019/2020 Code: ZSDA-3-0003-s ECTS credits: 4

Faculty of: Szkoła Doktorska AGH

Field of study: Szkoła Doktorska AGH Specialty: —

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

Lecture language: English Profile of education: Academic (A) Semester: 0

Course homepage: —

Responsible teacher: dr inż. Samek Lucyna (Lucyna.Samek@fis.agh.edu.pl)

Module summary

Student should characterize air pollutants. Student should have knowledge on EU regulations. Student knows how samples of PM are collected and how chemical content of PM are determined.

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: is able to			
M_K001	Student is able to perform experimental work in the form of team work and is able to discuss in scientific English	SDA3A_K01, SDA3A_K02	Report, Involvement in teamwork, Execution of exercises, Activity during classes
Skills: he can			
M_U001	Student should be capable of performing simple laboratory experiments	SDA3A_U02, SDA3A_U01, SDA3A_U04	Execution of laboratory classes, Completion of laboratory classes
M_U002	Student should be capable of using simple software for elemental analysis of particulate matter	SDA3A_U02, SDA3A_U05, SDA3A_U01, SDA3A_U04	Execution of laboratory classes, Completion of laboratory classes
Knowledge: he knows and understands			
M_W001	Student should characterize gaseous and particulate matter pollution together with identification of sources	SDA3A_W02, SDA3A_W01	Examination, Activity during classes
M_W002	Student should have knowledge on regulations of air pollution	SDA3A_W01, SDA3A_W06	Examination, Activity during classes

M_W003	Student should have knowledge on the impact of air pollution on human health and cultural heritage objects	SDA3A_W02	Examination, Activity during classes

Number of hours for each form of classes

	Form of classes										
Suma	Lectures	Auditorium classes	Laboratory classes	Project classes	Conversation seminar	Seminar classes	Practical classes	Fieldwork classes	Workshops	Prace kontrolne i przejściowe	Lektorat
30	15	0	15	0	0	0	0	0	0	0	0

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	Prace kontrolne i przejściowe	Lektorat
Social competence: is able to												
M_K001	Student is able to perform experimental work in the form of team work and is able to discuss in scientific English	-	-	-	-	-	-	-	-	-	-	-
Skills: he can												
M_U001	Student should be capable of performing simple laboratory experiments	-	-	+	-	-	-	-	-	-	-	-
M_U002	Student should be capable of using simple software for elemental analysis of particulate matter	-	-	+	-	-	-	-	-	-	-	-
Knowledge: he knows and understands												
M_W001	Student should characterize gaseous and particulate matter pollution together with identification of sources	+	-	-	-	-	-	-	-	-	-	-
M_W002	Student should have knowledge on regulations of air pollution	+	-	-	-	-	-	-	-	-	-	-
M_W003	Student should have knowledge on the impact of air pollution on human health and cultural heritage objects	+	-	-	-	-	-	-	-	-	-	-

Student workload (ECTS credits balance)

Student activity form	Student workload
Udział w zajęciach dydaktycznych/praktyka	30 h
Preparation for classes	28 h
przygotowanie projektu, prezentacji, pracy pisemnej, sprawozdania	30 h
Realization of independently performed tasks	30 h
Examination or Final test	2 h
Summary student workload	120 h
Module ECTS credits	4 ECTS

Additional information

Module content

Lectures

Lecture 1
Introduction. Definitions, natural, anthropogenic, primary, secondary pollution. Why it is important? Events: volcano in Indonesia influences on air in Europe.
Lecture 2
Gaseous pollution: SO2, NOx, CO, CO2, O3.
EU directives, WHO regulations, EPA regulations, Polish regulations. Concentration changes during years.
Lecture 3
Particulate matter pollution (PM).
Smog-definition, Smog in London (history). First regulations. Total suspended particulate matter (TSP), PM10, PM2.5, PM1.
EU directives, WHO regulations, EPA regulations, Polish regulations. Concentration changes during years.
Lecture 4
Particulate matter pollution (PM).
Sampling: methods, devices, EU directives, Polish regulations
Concentrations: EU directives, Polish regulations,
Chemical analyses – reference methods (EU,USA): elements, ions, organic compounds, black carbon, black smoke, organic carbon, C-14,
Lecture 5
Health impact of PM. Influence of size of particles, short term expose, long term expose. Diseases. Children, Elders. Program AirQ, what can be calculated. Data from whole world, Krakow.
Lecture 6
Receptor models for source identification and apportionment
Species (indicators) – what kind of sources?
Data preparation. Statistical analyses: principal component analysis (PCA), multilinear regression analysis (MLRA), positive matrix factorization (PMF), chemical mass balance (CMB).
How they work-explanation, results-examples.
Lecture 7

Air pollution and cultural heritage research. What is done? Why is done? Examples from Krakow research (Wawel, churches).

Laboratory classes

Exercise 1. Collection and gravimetrical analysis of particulate matter. (Report no 1). (Lab.-FPACS)
Exercise 2. Qualitative elemental analysis of particulate matter by energy dispersive X-ray spectrometry (Report no 2). (Lab.-FPACS)
Exercise 3. Quantitative elemental analysis of particulate matter by energy dispersive X-ray spectrometry (Report no 3). (Lab.-FPACS)

Teaching methods and techniques:

Lectures: Lectures: Treści prezentowane na wykładzie są przekazywane w formie prezentacji multimedialnej w połączeniu z klasycznym wykładem tablicowym wzbogaconymi o pokazy odnoszące się do prezentowanych zagadnień.
Laboratory classes:

Laboratory classes: W trakcie zajęć laboratoryjnych studenci samodzielnie rozwiązują zadany problem praktyczny, dobierając odpowiednie narzędzia. Prowadzący stymuluje grupę do refleksji nad problemem, tak by otrzymane wyniki miały wysoką wartość merytoryczną.

Warunki i sposób zaliczenia poszczególnych form zajęć, w tym zasady zaliczeń poprawkowych, a także warunki dopuszczenia do egzaminu:

The reports from the laboratories.

Zasady udziału w poszczególnych zajęciach, ze wskazaniem, czy obecność studenta na zajęciach jest obowiązkowa:

Lectures:
– Attendance is mandatory: Yes
– Participation rules in classes: – Attendance is mandatory: Yes
– Participation rules in classes: Studenci uczestniczą w zajęciach poznając kolejne treści nauczania zgodnie z syllabusem przedmiotu. Studenci winni na bieżąco zadawać pytania i wyjaśniać wątpliwości. Rejestracja audiowizualna wykładu wymaga zgody prowadzącego.
Laboratory classes:
– Attendance is mandatory: Yes
– Participation rules in classes: – Attendance is mandatory: Yes
– Participation rules in classes: Studenci wykonują ćwiczenia laboratoryjne zgodnie z materiałami udostępnionymi przez prowadzącego. Student jest zobowiązany do przygotowania się w przedmiocie wykonywanego ćwiczenia, co może zostać zweryfikowane kolokwium w formie ustnej lub pisemnej. Zaliczenie zajęć odbywa się na podstawie zaprezentowania rozwiązania postawionego problemu. Zaliczenie modułu jest możliwe po zaliczeniu wszystkich zajęć laboratoryjnych.

Method of calculating the final grade

EG- Exam Grade
LG- Laboratory Grade
Final Grade= 0.6EG+0.4LG

Sposób i tryb wyrównywania zaległości powstałych wskutek nieobecności studenta na zajęciach:

One absence on laboratories will be arrange individually.

Prerequisites and additional requirements
No prerequisities for foreign students.

Recommended literature and teaching resources
Recommended literature and teaching resources not specified

Scientific publications of module course instructors related to the topic of the module
SAMEK L., Stęgowski Z., Furman L., Styszko K., Szramowiat K., Fiedor J., Quantitative assessment of PM_{2.5} sources and their seasonal variation in Krakow, Water, Air and Soil Pollution, 2017 vol. 228 iss. 8 art. no. 290, s. [1–11]. https://goo.gl/mWLGVG

Lucyna Samek, Zdzislaw Stegowski, Katarzyna Styszko, Leszek Furman, Joanna Fiedor, Seasonal contribution of assessed sources to submicron and fine particulate matter in a Central European urban area, Environmental Pollution 241 (2018) 406-411.

SAMEK L., Overall human mortality and morbidity due to exposure to air pollution, International Journal of Occupational Medicine and Environmental Health, 2016 vol. 29 no. 3, s. [1–10].

Additional information
None