MODULE SPECIFICATION

Module code	
Module title in Polish	**Meteorologia, klimatologia i ochrona powietrza**
Module title in English	**Meteorology, Climatology and Air Protection**
Module running from the academic year	**2016/2017**

A. MODULE IN THE CONTEXT OF THE PROGRAMME OF STUDY

Field of study	**Environmental Engineering**
Level of qualification	**first cycle** (first cycle, second cycle)
Programme type	**academic** (academic/practical)
Mode of study	**full-time** (full-time/part-time)
Specialism	
Organisational unit responsible for module delivery	**Department of Water and Wastewater Engineering**
Module co-ordinator	**dr hab. Lidia Dąbek, prof. PŚk**
Approved by:	**Prof.dr hab. Elżbieta Bezak-Mazur, Department of Water and Wastewater Engineering**

B. MODULE OVERVIEW

Module type	**core module** (core/programme-specific/elective HES*)
Module status	**compulsory module** (compulsory/optional)
Language of module delivery	**Polish/English**
Semester in the programme of study in which the module is taught	**semester 2**
Semester in the academic year in which the module is taught	**summer semester** (winter semester/summer semester)
Pre-requisites	**None** (module code/module title, where appropriate)
Examination required	**Yes**
ECTS credits	**4**

* elective HES – elective modules in the Humanities and Economic and Social Sciences

Mode of instruction	lectures	classes	laboratories	project	others
Total hours per semester	30	-	-	15	-

C. LEARNING OUTCOMES AND ASSESSMENT METHODS

Module aims	The aim of the module is to familiarise students with the following: the structure, dynamics, and thermodynamics of atmosphere in relation to spreading pollutions in atmospheric air, the characteristics of pollution and its impact; the methods of purifying gases as well as legal aspects of air protection.

Module outcome code	Module learning outcomes	Mode of instruction *(l/c/lab/p/ others)*	Corresponding programme outcome code	Corresponding discipline-specific outcome code
W_01	A student has knowledge as regards the structure of atmosphere (together with the phenomena and processes having an impact on spreading pollution in the atmosphere).	l	IŚ_W01	T1A_W01; T1A_W02
W_02	A student knows and understands chemical and photochemical processes concerning pollution and their impact on the environment (both at a global and local scale).	l	IŚ_W07 IŚ_W16	T1A_W01; T1A_K03 T1A_K08 T1A_W03; T1A_W05 T1A_W07; T1A_W08
W_03	A student is knowledgeable on the methods of limiting pollution emission as well as purifying exhaust gases.	l/p	IŚ_W09	T1A_K03; T1A_W04 T1A_W05, T1A_W06; T1A_W07
W_04	A student is familiar with legal, administrative and technical aspects of air protection.	l/p	IŚ_W18	T1A_W02; T1A_W07 T1A_W08
U_01	A student is able to explain the relationship between the structure, dynamics, and thermodynamics of atmosphere and spreading pollution.	l/p	IŚ_U01 IŚ _U09 IŚ_U17	T1A_U01 T1A_U04, T1A_U08; T1A_U09 T1A_U10
U_02	A student is capable of explaining the causes and effects concerning air pollution; a student can also interpret available data concerning emission and immission.	l/p	IŚ_U02	T1A_U01; T1A_U05 T1A_U07
U_03	A student can characterise the principles of operation as regards basic devices applied to remove exhaust gases.	l/p	IŚ_U12 IŚ_U25	T1A_U07 T1A_U08;; T1A_U09 T1A_U10
U_04	A student can independently make basic calculations concerning pollution spreading in atmospheric air from a point emission source with the use of referential methodology; a student can also make calculations as regards pollution concentration level in atmospheric air and exhaust	p	IŚ_U17	T1A_U07; T1A_U08 T1A_U09

	gases (and compare it with permissible values which are determined in appropriate legal acts).			
K_01	A student is aware of the effects of atmospheric pollution and the necessity of taking action which leads to limiting emission, permanent monitoring as well as implementing new effective technologies.	l/p	IŚ_K03 IŚ_K09	T1A_K01; T1A_K02 T1A_K04
K_02	A student can work individually and in a team. A student is responsible for the reliability of the obtained results. Moreover, a student can interpret the obtained results and formulate conclusions.	p	IŚ_K01 IŚ_K02 IŚ_K05	T1A_K02; T1A_K03; T1A_K04; T1A_K05;
K_03	A student understands the necessity of raising social awareness on cause and effect relationship between air and environment quality.	l/p	IŚ_K06	T1A_K06; T1A_K07

Module content:

1. Topics to be covered in the lectures

No.	Topics	Module outcome code
1	The structure and composition of atmosphere, atmosphere energy, greenhouse effect.	W_01 U_01 U_02 K_01 K_03
2	Atmosphere thermodynamics, temperature inversion.	W_01 U_01 U_02 K_01 K_03
3	Atmosphere dynamics, global and local atmosphere circulation.	W_01 U_01 U_02 K_01 K_03
4	Climate-generating factors and processes, anthropogenic climate changes, climate-generating processes over an industrial area industrialized.	W_02 U_01 U_02 K_01 K_03
5	Legal fundamentals of air protection, standardising the value of emission and immission, air monitoring. Qualitative and quantitative characteristics of emission sources and volume.	W_04 U_02
6	The characteristics of inorganic pollution. Emission effects of inorganic pollution as well as dust to atmosphere, smog, and environmental acidification.	W_02 U_02 K_01 K_03
7-8	The characteristics of organic pollution. Emission effects of organic pollution to atmosphere, photochemical processes, and the ozone hole.	W_02 U_02 K_01 K_03
9-10	Exhaust gas dedusting.	W_03 W_04 U_03 K_01 K_03
11-12	Removing gaseous pollution from exhaust gases; limiting odour emission.	W_03 W_04 U_03 K_01 K_03
13		W_03

	Fumes desulphurisation.	W_04 U_03 K_01 K_03
14	Limiting the emission of NO_x.	W_03 W_04 U_03 K_01 K_03
15	The installations of gas purification systems in cement manufactures, waste combustion plants and power stations.	W_03, W_04 U_03 K_01 K_03

2. Topics to be covered in the project classes

No.	Topics	Module outcome code
1	Calculating the value of emission as well as concentration of pollutions in atmospheric air (immission).	W_01 U_01 U_04 K_01 K_02 K_03
2	Analysing a referential methodology of spreading pollution in atmospheric air.	W_01 U_01 U_04 K_01 K_02 K_03
3	The project of spreading pollution from a point source of emission in the assigned conditions (calculating effective emitter height).	W_01 U_01 U_04 K_01 K_02 K_03
4	A project of spreading pollution from a point source of emission in the assigned conditions (calculating the coefficients of terrain roughness as well as the coefficients of diffusion).	W_01 U_01 U_04 K_01 K_02 K_03
5	A project of spreading pollution from a point source of emission in the assigned conditions (calculating maximum concentration at Earth surface and its distance of occurrence).	W_01 U_01 U_04 K_01 K_02 K_03

6	A project of spreading pollution from a point source of emission in the assigned conditions (calculating substance concentration in an arbitrary point of space).	W_01 U_01 U_04 K_01 K_02 K_03
7	Calculating the efficiency of operation concerning devices purifying exhaust gases.	W_03 U_03 K_01 K_02 K_03

Assessment methods

Module outcome code	**Assessment methods** *(Method of assessment; for module skills − reference to specific project, laboratory and similar tasks)*
W_01	An examination
W_02	An examination
W_03	An examination and obtaining a credit for the project
W_04	An examination and obtaining a credit for the project
U_01	An examination and obtaining a credit for the project
U_02	An examination and obtaining a credit for the project
U_03	An examination and obtaining a credit for the project
U_04	Obtaining a credit for the project
K_01	An examination and obtaining a credit for the project
K_02	Completing and obtaining a credit for the project
K_03	An examination and obtaining a credit for the project

D. STUDENT LEARNING ACTIVITIES

ECTS summary		
	Type of learning activity	**Study time/ credits**
1	Contact hours: participation in lectures	**30**
2	Contact hours: participation in classes	
3	Contact hours: participation in laboratories	
4	Contact hours: attendance at office hours (2-3 appointments per semester)	**4**
5	Contact hours: participation in project-based classes	**15**
6	Contact hours: meetings with a project module leader	**4**
7	Contact hours: attendance at an examination	**2**
8		
9	**Number of contact hours**	**55** *(total)*
10	**Number of ECTS credits for contact hours** *(1 ECTS credit =25-30 hours of study time)*	**2,2**
11	Private study hours: background reading for lectures	**10**
12	Private study hours: preparation for classes	
13	Private study hours: preparation for tests	**5**
14	Private study hours: preparation for laboratories	
15	Private study hours: writing reports	
16	Private study hours: preparation for a final test in laboratories	
17	Private study hours: preparation of a project/a design specification	**15**
18	Private study hours: preparation for an examination	**15**
19		
20	**Number of private study hours**	**45**
21	**Number of ECTS credits for private study hours** *(1 ECTS credit =25-30 hours of study time)*	**1,8**
22	**Total study time**	**100**
23	**Total ECTS credits for the module** *(1 ECTS credit =25-30 hours of study time)*	**4**
24	**Number of practice-based hours** *Total practice-based hours*	**34**
25	**Number of ECTS credits for practice-based hours** *(1 ECTS credit =25-30 hours of study time)*	**1,36**

E. READING LIST

References	1. J.Juda. Ochrona Powietrza atmosferycznego, WNT, Warszawa 1974 2. J.Zwoździak, A.Zwoździak, A.Szczurek: Meteorologia w ochronie atmosfery, Wyd. Politechniki Wrocławskiej, Wrocław 1998 3. R. Gryboś, S. Tomaszek, Procesy klimatotwórcze nad terenem uprzemysłowionym, Wyd. Politechniki Śląskiej, Gliwice 1997 4. T. Piecuch, L.Dąbek, B. Juraszka; Spalanie i piroliza odpadów oraz ochrona powietrza przed szkodliwymi składnikami spalin. Wyd. Politechniki Koszalińskiej, Koszalin 2002 5. J.Warych: Oczyszczanie gazów. Procesy i aparatura, WNT Warszawa 1998 6. Rutkowski J.D., Syczewska K., Trzepierczyńska L: Podstawy inżynierii ochrony atmosfery, Wyd. Politechniki Wrocławskiej, Wrocław 1993. 7. J.Kośmider, B.Mazur-Chrzanowska, B.Wyszyński, Odory, Wydawnictwo Naukowe PWN, Warszawa 2002 8. J.Kuropka: Oczyszczanie gazów, Wyd. Politechniki Wrocławskiej, Wrocław 1999 9. B.Górka, S.Kowalski: Badania zanieczyszczeń powietrza, Wyd. Politechniki Śląskiej, Gliwice 2000 10. J.Cebula: Wybrane zagadnienia ochrony środowiska, Wyd. Politechniki Śląskiej, Gliwice 2000 11. J.Więckowska, Katalityczno-adsorpcyjne odsiarczanie gazów. Wyd. Politechniki Wrocławskiej, Wrocław 1994 12. K.Rup, Procesy przenoszenia zanieczyszczeń w środowisku naturalnym, WNT, Warszawa 2006, 13. M.T.Markiewicz, Podstawy modelowania rozprzestrzeniania się zanieczyszczeń w powietrzu atmosferycznym, Oficyna Wydawnicza Politechniki Warszawskiej, 2004 14. K.Juda-Rezler, Oddziaływanie zanieczyszczeń powietrza na środowisko, Oficyna Wydawnicza Politechniki Warszawskiej, 2000 15. M.Sowiński, E.Wołoszyn, Meteorologia i klimatologia w zarysie, Wydawnictwo Politechniki Poznańskiej, 2013 16. Aktualnie obowiązujące akty prawne w zakresie ochrony powietrza dostępne na stronie www.sejm.gov.pl 17. Barry R.G., Chorley R.J., Atmosphere, Weather and Climate, London New York: Routledge, 1990 18. Gliński J., Józefaciuk G., Stahr K. (ed.), Soil - plant - atmosphere : aeration and environmental problem, Hohenheim University, Institute of Agrophysics Polish Academy of Sciences, 2004 19. Zumthor P., Atmospheres : architectural enviroments, surrounding objects, Basel : Birkhäuse, 2010 20. International School of Atmospheric Physics, Physics of the upper atmosphere : International School of Atmospheric Physics, "Ettore Majorana" Centre for Scientific Culture : Proceedings Course Erice, June 15-29, 1970 / Ed. by Franco Verniani. of the

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Module website	**www.tu.kielce.pl**