Course title: **Meteorology and Climatology Meteorologia i Klimatologia**		
Programme: **Environmental engineering**		Code: **5.11**
Type of course: **Elective course, Blok IVA**	Course level: **I**	Semester: **IV**
Form of classes: **Lecture, tutorials**	Number of hours per week~~/meeting:~~ **2W, 1C**	Credit points: **2**
Education profile: **General academic**		Course language: **Polish**
Enrolment: **yes**		

GUIDE TO THE SUBJECT

I. COURSE CHART

COURSE OBJECTIVES

C.1. Obtaining knowledge in the field of meteorology basics in order to later forecast and calculate the spread of pollutants, their impact on the weather and climate change
C.2. Acquiring the ability to solve basic problems related to phenomena occurring in the Earth's atmosphere

PRELIMINARY COURSE REQUIREMENTS FOR KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Fundamentals of chemistry, physics and mathematics
2. The ability to conduct engineering calculations

LEARNING OUTCOMES

EK 1 - The student has knowledge about the structure and chemical composition of the Earth's atmosphere
EK 2 - The student has knowledge about the processes of heat exchange in the atmosphere
EK 3 - The student understands the issues of atmosphere stability
EK 4 - The student has knowledge of the causes of the formation of horizontal air masses and understands the role of winds in the atmosphere
EK 5 - The student has the ability to calculate the basic parameters and physical properties of gases in the atmosphere

COURSE CONTENT

Form of classes - lectures	Hours
Main concepts: meteorology, climatology, weather, weather forecast. Climate, main climate factors. Meteorological networks, meteorological measurements, meteorological stations. Chemical composition of the atmosphere: components and admixtures of air. The chemical composition of soil air. Atmospheric pollution, their impact on weather and climate change. Vertical composition of the atmosphere.	2
Heat exchange in the atmosphere. Conduction and convection. Thermometric scales. The role of sensible and latent heat in the atmosphere. Evaporation and condensation.	2
Earth and atmosphere radiation. Nature of radiation. The Wien's and the Stefan-Boltzmann laws. Measurement of solar radiation. Phenomena of scattering, absorption and reflection of solar radiation in the atmosphere.	2
The role of the greenhouse effect in shaping the climate on Earth. The annual energy balance of the Earth. Variation of the seasons.	2
Diurnal variability of air temperature. Factors that cause temperature variability. Air temperature and thermal comfort. Measurements of air temperature.	2
Types of precipitation. The formation of precipitation. Rainfall measurement.	2
Water circulation in the atmosphere. Water vapor saturated and unsaturated. Humidity. Dew point temperature.	2
Relative humidity and thermal discomfort. Relative humidity measurement. Hydrometeors.	2
Balance of the atmosphere. Determination of atmosphere stability. Dry and humidadiabatic gradient.	2
Cloud formation. Classification and types of clouds.	2
Atmospheric pressure. Barometric equation. Atmospheric pressure measurement. Plots of surface pressure and upper air layers.	2
Wind. Factors causing horizontal air mass movement. The force of the pressure gradient. Coriolis force. Centrifugal force. Surface friction. Types of winds: geostrophic, gradient, thermal, cyclostrophic, geotryptic.	2
Atmospheric circulations. Spatial scales of air movement in the atmosphere. Local winds - sea, land, mountain, valley breezes. Seasonally variable winds - monsoons. Katabatic winds. Desert winds.	2
Models of global air mass circulation in the atmosphere. Tropospheric stream currents.	2
Summary. Final assessment.	2
Form of classes - tutorials	**Hours**
Conversion of pressure and temperature units - working examples	1
Physical basis of kinetic-molecular theory. Clapeyron equation - working examples	2
Physical basis of kinetic-molecular theory. Dalton's law - working examples	2
The state of the ideal gas mixture. Mass, volume and molar shares - working examples	2
Humid air. The density of saturated and unsaturated water vapor. Dew point temperature - working examples	2

Barometric equation. The dependence of temperature on the altitude in the atmosphere - working examples	2
Thermal radiation of the atmosphere. The law of Stefan-Boltzmann. The Law of Wien - working examples.	2
Test	1
Final assessment.	1

COURSE STUDY METHODS

1. Lectures with multimedia presentations
2. Tutorials with blackboard
3. Scientific tables

METHODS OF ASSESMENT (F - formative; S - summative)

F1. – Assessment of activities during tutorials
F2. – Assessment of activities during lectures
S1. – Tests

STUDENT WORKLOAD

Form of activity	Workload (hours)
Participation in lectures	30 h
Participation in classes	14 h
Laboratory	- h
Participation in project classes	- h
Participation in seminar	- h
Preparation course on e-learning	- h
Test	1 h
Entrance test for laboratory classes	- h
Project's defence	- h
Exam	- h
Consultation hours	4 h
DIRECT TEACHING, hours/ ECTS	**49 h / 1,5 ECTS**
Preparation for tutorials	10 h
Preparation for laboratories	- h
Preparation for projects	- h
Preparation for seminars	- h
Preparation for e-learning classes	- h
Participation in e-learning classes	- h
Working on project	-h
Preparation for tests	5 h
Preparation for exam	- h
SELF-STUDY, hours/ ECTS	**15 h / 0,5 ECTS**
TOTAL (hours)	**∑ 64 h**
TOTAL ECTS	**2 ECTS**

PRIMARY AND SUPPLEMENTARY TEXTBOOKS

1. Kożuchowski K., Meteorologia i Klimatologia, PWN, Warszawa 2006
2. Retallack J., Podstawy meteorologii, 1991, IMGW, Warszawa
3. Chromow S.P., Meteorologia i klimatologia, 1977, Wyd. PWN, Warszawa
4. Ahrens C. Donald, Essentials of Meteorology - An invitation to the Atmosphere – Third edition

SUBJECT COORDINATOR (NAME, SURNAME, E-MAIL ADDRESS)

1. Dr hab. inż. Paweł MIREK, pmirek@neo.pl

NAME OF LECTURER (s) (NAME, SURNAME, E-MAIL ADDRESS)

1. Dr hab. inż. Paweł MIREK, pmirek@neo.pl

Learning outcome	In relation to the learning outcomes specified for the field of study	Course objectives	Course content	Course study methods	Methods of assesment
EK1	**K_W02, K_U05**	**C.1**	Lectures	1	**F1, P2**
EK2	**K_W02, K_U05**	**C.1**	Lectures	1	**F1, P2**
EK3	**K_W02, K_U05**	**C.1**	Lectures	1	**F1, P2**
EK4	**K_W02, K_U05**	**C.1**	Lectures	1	**F1, P2**
EK5	**K_W02, K_U05**	**C.1**	Lectures	1	**F1, P2**
EK6	**K_U01, K_U05**	**C.2**	Tutorials	2	**F1, F2, P1**

II. OTHER USEFUL INFORMATION

1. All the information on the class schedule is posted on the student information board and online at: www.is.pcz.pl
2. The information about the consultation hours is provided to students on the first class meeting and posted online at: www.is.pcz.pl

III. The information on course completion and grade is provided to students on the first class meeting.