COURSE DESCRIPTION CARD

<table>
<tr><td colspan="10">Faculty of Civil and Environmental Sciences</td></tr>
<tr><td>Field of study</td><td colspan="6">Environmental Engineering</td><td colspan="2">Degree level and programme type</td><td>Master's degree</td></tr>
<tr><td>Specialization/ diploma path</td><td colspan="6">Mutual subjects for whole course</td><td colspan="2">Study profile</td><td>general</td></tr>
<tr><td rowspan="2">Course name</td><td colspan="6" rowspan="2">Environmental chemistry</td><td colspan="2">Course code</td><td>EEM11002</td></tr>
<tr><td colspan="2">Course type</td><td>compulsory</td></tr>
<tr><td rowspan="2">Forms and number of hours of tuition</td><td>L</td><td>C</td><td>LC</td><td>P</td><td>SW</td><td>FW</td><td>S</td><td>Semester</td><td>1</td></tr>
<tr><td>15</td><td></td><td>30</td><td></td><td></td><td></td><td></td><td>No. of ECTS credits</td><td>3</td></tr>
<tr><td>Entry requirements</td><td colspan="9">basic knowledge of sanitary chemistry, sanitary biology, water management and water protection, water and wastewater technology</td></tr>
<tr><td>Course objectives</td><td colspan="9">Familiarising with the division and characterisation of the most important laboratory techniques used in the physico-chemical analysis of water and wastewater. Teaching a methodology for the determination of indicators characterising physical conditions, including thermal conditions, oxygen conditions, organic pollutants, salinity, acidification, biogenic conditions used in the classification of surface water status, and indicators conditioning the discharge of waste water into water or into the ground, including substances particularly harmful to the aquatic environment. Understanding the circulation and toxicity of selected chemicals in the environment. Presentation of the general characteristics and methodology for the identification of by-products resulting from technological unit processes of water and wastewater treatment. Teaching the physico-chemical and biochemical transformations of selected chemical compounds occurring in water and wastewater. Getting acquainted with basic methods of statistical analysis of obtained test results and preparation for the conduct and implementation of scientific research</td></tr>
<tr><td>Course content</td><td colspan="9"><u>Lecture</u>: Division and characterisation of the main laboratory techniques used in the physico-chemical analysis of water and wastewater. Detailed methodology for performing the determinations required by the standard for the classification of water and wastewater. Characterisation and breakdown of water pollution. Cycle of nitrogen, phosphorus and sulphur in the environment. Biodegradation processes of organic pollutants. Basic issues of toxicity of chemical compounds: dose-response, toxicity of a chemical compound, methods of classifying xenobiotics. By-products of water disinfection, chemical oxidation (e.g. TOX, LTOX, NTOX, THM, AOX, EOX and others).</td></tr>
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	Principles of environmental sampling, fixation and preparation. Testing of water aggressiveness to concrete. Physico-chemical analysis of water to assess the corrosivity of water. Weight and volume analysis in water and wastewater. Spectroscopic, potentiometric and conductivity methods in water and wastewater analysis. Remediation of water and ground environment. Ionic balance of water.	
Teaching methods	Informative lecture, problem-based lecture, laboratory classes	
Assessment method	Lecture – test colloquium; Laboratory classes- partial written tests on the preparation for classes	
Symbol of learning outcome	Learning outcomes	Reference to the learning outcomes for the field of study
LO1	student knows and understands in depth the basic laboratory techniques and methods of physico-chemical analyses of water and sewage, has knowledge of the processes taking place and is able to plan experiments properly.	IS_W01 IS2_U01
LO2	student knows the latest directions of development of analytical methodology in environmental engineering, is able to interpret the results obtained and on this basis draw correct conclusions.	IS2_W06 IS2_U01
LO3	student knows and understands the sources of environmental pollution and the chemistry of changes taking place in water and sewage, is able to properly plan and perform physicochemical analyses, interpret their results and on this basis draw correct conclusions.	IS_W01 IS2_U01 IS2_U05 IS2_K06
LO4	student knows and understands the latest methods of identification and management of by-products resulting from the technological processes of unit water and sewage treatment; he or she is able to use scientific, popular science and industry literature, subject standards, legal acts, Internet databases both in Polish and foreign languages; to properly use the information obtained as well as to formulate and present opinions.	IS2_W01 IS2_W04 IS2_U09
LO5	student is ready to apply and observe the rules of professional ethics and behave in a professional manner when taking samples, planning and conducting physico-	IS2_U05 IS2_K06

	chemical tests, using specialist scientific and research equipment, and to interpret the results obtained and draw conclusions	
Symbol of learning outcome	Methods of assessing the learning outcomes	Type of tuition during which the outcome is assessed
LO1	assessment of work during laboratory classes and evaluation of prepared reports on exercises performed	LC
LO2	assessment of work during laboratory classes and evaluation of prepared reports on exercises performed	LC
LO3	assessment of work during laboratory classes and evaluation of prepared reports on exercises performed	LC
LO4	assessment of work during laboratory classes and evaluation of prepared reports on exercises performed	LC
LO5	assessment of work during laboratory classes and evaluation of prepared reports on exercises performed	LC

Student workload (in hours)		No. of hours
Calculation	participation in lectures	15
	participation in laboratory classes	30
	preparation for written lecture credit	10
	preparation of reports and preparation for tests of laboratory exercises	15
	participation in consultations	5
	TOTAL:	75

Quantitative indicators	HOURS	No. of ECTS credits
Student workload – activities that require direct teacher participation	50	2
Student workload – practical activities	50	2

Basic references	1. . Manahan S.E. Environmental Chemistry. Taylor & Francis/CRC Press, 2022 2.Miroslav Radojevic Vladimir N Bashkin; V. N: Practical environmental analyses, Royal Society of Chemistry (Great Britain), 2007; 2. R M Harrison Roy M Harrison; P Monks; Stephen J De Mora; J. G Farmer; M. C Graham; C Hulsall; Ian D Pulford: Principles of environmental chemistry, Society of Chemistry (Great Britain) 2007

	3. W. H. Freeman, 2008 3. Andrews J.E., Brimblecombe P., Jickells T.D., Liss P.S., Reid B. J. An Introduction to Environmental Chemistry. Blackwell Publishing, 2004 4. Alfred R. Conklin Jr, Field Sampling: Principles and practices in Environmental Analysis, New York: Taylor&Francis Group, 2017	
Supplementary references	**Crowe J., BradshawT.,Chemistry for the Bioscience, Oxford University Press, Oxford, 2010**	
Organisational unit conducting the course	**Department of technology in environmental engineering**	**Date of issuing the programme**
Author of the programme	**Joanna Szczykowska PhD**	**11.06.2023 r**

L – lecture, C – classes, LC – laboratory classes, P – project, SW – specialization workshop, FW - field work, S – seminar