COURSE DESCRIPTION CARD

<table>
<tr><td colspan="10">Faculty of Civil Engineering and Environmental Sciences</td></tr>
<tr><td>Field of study</td><td colspan="5">Environmental Engineering</td><td colspan="2">Degree level and programme type</td><td colspan="2">Bachelor's degree</td></tr>
<tr><td>Specialization/ diploma path</td><td colspan="5">International School of Engineering</td><td colspan="2">Study profile</td><td colspan="2">Academic profile</td></tr>
<tr><td rowspan="2">Course name</td><td colspan="5" rowspan="2">Industrial Water Treatment</td><td colspan="2">Course code</td><td colspan="2">19284211H/IS1S51042</td></tr>
<tr><td colspan="2">Course type</td><td colspan="2">Obligatory</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 colspan="2">VI</td></tr>
<tr><td>16</td><td>-</td><td>16</td><td>-</td><td>-</td><td>-</td><td>-</td><td>No. of ECTS credits</td><td colspan="2">3</td></tr>
<tr><td>Entry requirements</td><td colspan="9">Chemistry, Ecology, Water Technology, Environmental Chemistry</td></tr>
<tr><td>Course objectives</td><td colspan="9">The goal of the course is to introduce the student to the general characteristics of water taken for industrial purposes, to recognize their quantity and quality. Objective takes into consideration presentation of mechanical, physic-chemical, biological and chemical methods of water treatment. The aim of the subject is also to teach the student about the phenomena taking place during individual processes of industrial water purification. The basic issue here is the optimal selection and sequence of water purification processes in the system and the their correct order, according to which the required water quality is achieved. Student got information about water treatment technology that meets the requirements of a particular industrial manufacturing line for individual processes.</td></tr>
<tr><td>Course content</td><td colspan="9">Lecture: 1. Types, water exploitation characteristics, technological processes for industrial water treatment. Single and multi-processes usage in the real conditions. Particular methods required for needed industrial water quality.
Examples of individual technological solutions and industrial processes – characteristics of selected industries. Examples of the partial and the whole treatment lines for considered industry. i.e. adsorption, water softening, demineralization, membrane technology, water stabilization.
Laboratory: 1. Water treatment technology selection depending on water features and parameters. 2. Water softening using physical and chemical methods. 3. Water softening using ion exchange. 4. Adsorption with GAC and PAC. 5. Water demineralization 6. Water stabilization 7&8 the whole water treatment line for particular industries.</td></tr>
<tr><td>Teaching methods</td><td colspan="9">Informational and problematic lecture,
Simulation of technological processes with laboratory methods.</td></tr>
<tr><td>Assessment method</td><td colspan="9">Lecture - written exam,
Laboratory - written tests during lab-classes, laboratory evaluation reports.</td></tr>
<tr><td>Symbol of learning outcome</td><td colspan="7">Learning outcomes</td><td colspan="2">Reference to the learning outcomes for the field of study</td></tr>
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LO1	The student has advanced knowledge in basic methods of physicochemical and physical analyses, processes and phenomena in water and the latest methods of water treatment.	**IS1_W07** **IS1_W06**
LO2	Student knows at an advanced level - issues of mathematics, physics, chemistry, biology, which are the basis of processes occurring in environmental engineering. The student is able to use scientific, popular-scientific and industry literature, subject matter norms, legal acts, Internet databases in both Polish and foreign languages, make proper use of the acquired information, draw conclusions, formulate and present opinions, evaluate and discuss various opinions.	**IS1_W02** **IS1_U14**
LO3	Students are able to plan and conduct water physico-chemical tests with the use of specialist scientific and research equipment, interpret their results and on this basis reach adequate conclusions,	**IS1_U02**
LO4	The student is able to analyze and evaluate technical, technological and organizational solutions concerning emerging pollution, he or she is able to act in a creative and entrepreneurial way, cooperate in a group, assuming different roles in it.	**IS1_U08** **IS1_U16**
LO5	The student is able to plan and conduct advanced experiments, including measurements of technical, technological and operational parameters of equipment used in environmental engineering, interpret the obtained results and draw conclusions.	**IS1_U07**
LO6	Student Is able to analyse the content of different sources and to critically assess the possibility of their use in professional practice.	**IS1_K01**

Symbol of learning outcome	**Methods of assessing the learning outcomes**	**Type of tuition during which the outcome is assessed**
LO1	Written exam	L
LO2	Written exam, partial test	L, LC
LO3	Written exam, partial test	L, LC
LO4	Written exam, partial test	L, LC
LO5	Written exam, partial test	L, LC
LO6	Written exam	L

Student workload (in hours)		**No. of hours**
Calculation	Lecture attendance	16
	Participation at laboratory classes	16
	Preparation for exam	8
	Preparation for laboratory	8
	Working on tasks, reports	16
	Participation in student-teacher sessions related to the classes/lab/lecture	5

	TOTAL:	**77**	
Quantitative indicators		**HOURS**	**No. of ECTS credits**
Student workload – activities that require direct teacher participation		**37**	**1,5**
Student workload – practical activities		**53**	**2,0**
Basic references	1. Water quality : characteristics, modeling, modification, George Tchobanoglous Edward D Schroeder, 1985 2. Water, Joachim Fischer Ed. 2008 3. Ray, Chittaranjan, Jain, Ravi Drinking Water Treatment Wastewater, Springer 2011		
Supplementary references	1. James K. Edzwald, Water Quality and Treatment: A Handbook on Drinking Water American Society of Civil Engineers, McGraw-Hill 2011, 2. Water pollution, B Allard Contrib., 1991 3. Water enjoyment : sustainable quality, technology and design, Dirk Meyhöfer Ed.; David J Haines Ed., 2011		
Organisational unit conducting the course	**Department of Technology in Environmental engineering**	**Date of issuing the programme**	
Author of the programme	**Prof. Iwona Skoczko**	**05.05.2022**	

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