



Subject card

Subject name and code	Water and Waste-water Technology II, PG_00042694						
Field of study	Environmental Engineering						
Date of commencement of studies	October 2020	Academic year of realisation of subject			2022/2023		
Education level	first-cycle studies	Subject group			Obligatory subject group in the field of study Subject group related to scientific research in the field of study		
Mode of study	Part-time studies	Mode of delivery			at the university		
Year of study	3	Language of instruction			Polish		
Semester of study	6	ECTS credits			4.0		
Learning profile	general academic profile	Assessment form			exam		
Conducting unit	Department of Environmental Engineering Technology -> Faculty of Civil and Environmental Engineering						
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Krzysztof Czerwionka					
	Teachers	dr hab. inż. Krzysztof Czerwionka dr inż. Alina Wargin					
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	16.0	0.0	18.0	0.0	0.0	34
E-learning hours included: 0.0							
Learning activity and number of study hours	Learning activity	Participation in didactic classes included in study plan	Participation in consultation hours		Self-study		SUM
	Number of study hours	34	5.0		62.0		101
Subject objectives	Presentation of the basic range of knowledge on issues of quantity and quality of waste water treatment processes and of the basic range of knowledge on issues of quantity and quality of waste water treatment processes and knowledge on mechanical- biological treatment using activated sludge method and biological filters.						
Learning outcomes	Course outcome	Subject outcome			Method of verification		
	[K6_U01] has the ability to self-education, can obtain information from literature, databases and other sources, uses information technology, Internet resources; can integrate the obtained information, make their interpretation, as well as draw conclusions and formulate and justify opinions	The student understands the need knowledge update in the field wastewater characteristics and its influence on the selection of unit pollution removal processes			[SU3] Assessment of ability to use knowledge gained from the subject [SU5] Assessment of ability to present the results of task		
	[K6_U09] is able to use well-chosen methods and measuring devices that enable determination of basic parameters of the water treatment process and wastewater treatment; can perform simple laboratory tests leading to the assessment of water quality, pollutant load in sewage	The student is able to do laboratory research for the appointment parameters of unit pollution removal processes			[SU1] Assessment of task fulfilment [SU3] Assessment of ability to use knowledge gained from the subject [SU5] Assessment of ability to present the results of task		
[K6_W03] has a structured and theoretically founded knowledge in the field of chemistry and biology, including knowledge necessary to understand the technological processes related to water treatment, wastewater treatment, waste management and sludge management	The student is able to use knowledge of chemistry and biology to evaluate the effectiveness of processes used for wastewater treatment			[SW1] Assessment of factual knowledge [SW3] Assessment of knowledge contained in written work and projects			

Subject contents	Lecture Basic concepts and definitions. Indicators and criteria for assessing water quality. Pollutant loads. Discharge of sewage into the environment: water receivers, legal considerations. Processes and process systems of mechanical wastewater treatment. Biological unit processes: hydrolysis, oxidation, ammonification, nitrification, denitrification, biological defosfatacja, producing volatile fatty acids. The method of activated sludge: microbial composition of the sediment parameters, technical equipment and systems. Method of biological deposits: types of deposits, process parameters, process systems. Natural methods of wastewater treatment: soil-plant wastewater treatment, agricultural use of sewage, household wastewater. Disposal of sewage sludge. Laboratory Determination of selected water quality parameters. Study wastewater COD fractions. Examination of technological parameters of the conventional activated sludge system. Rate test unit processes in a bioreactor to study the effectiveness of the work of sequential removal of nitrogen and phosphorus in a multiphase bioreactor with activated sludge. Treatment of industrial wastewater contaminated with oil emulsions. Chemical removal of phosphorus from wastewater.		
Prerequisites and co-requisites	Knowledge of the subjects: Chemistry, Biology and Ecology		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Written exam	60.0%	70.0%
	Laboratory exercises	60.0%	30.0%
Recommended reading	Basic literature	1. Łomotowski J., Szpindor A.: Nowoczesne systemy oczyszczania ścieków. Arkady, Warszawa, 1999. 2. Praca zbiorowa (red.: Oleszkiewicz J.): Poradnik eksploatatora oczyszczalni ścieków. Wyd. PZiTS, Poznań, 1997. 3. Henze M., Harremoës P., Jansen J., Arvin E.: Oczyszczanie ścieków procesy biologiczne i chemiczne. Wyd. Politechniki Świętokrzyskiej, Kielce, 2002. 4. Bever J., Stein A., Teichmann H.: Zaawansowane metody oczyszczania ścieków eliminacja azotu i fosforu, sedymentacja i filtracja. Wyd. Projprzem-Eko, Bydgoszcz, 1997.	
	Supplementary literature	1. Magrel L.: Uzdatnianie wody i oczyszczanie ścieków. Wyd. Ekonomia i Środowisko, Białystok, 1999. 2. Bernacka J., Kurbiel J., Pawłowska L.: Usuwanie związków biogenych ze ścieków miejskich. Wydawnictwo Instytutu Ochrony Środowiska, Warszawa, 1992.	
	eResources addresses	Adresy na platformie eNauczenie: Technologia Wody i Ścieków II_NS_2023 - Moodle ID: 30059 https://enauczenie.pg.edu.pl/moodle/course/view.php?id=30059	
Example issues/ example questions/ tasks being completed	<p>Laboratory - perform laboratory for the analysis of effluent quality and process chemical and biological wastewater treatment. Execution of laboratory studies .</p> <p>Passing the written test - sample questions : 1. List and discuss the parameters of the processes of nitrification and denitrification . 2. Draw and describe the sequential action of the activated sludge bioreactor . 3. Discuss the mechanism of biological phosphorus removal process . 4. Draw and describe the operation of any phase of activated sludge system</p> <p>Laboratory - perform laboratory for the analysis of effluent quality and process chemical and biological wastewater treatment. Execution of laboratory studies . Passing the written test - sample questions : 1. List and discuss the parameters of the processes of nitrification and denitrification . 2. Draw and describe the sequential action of the activated sludge bioreactor . 3. Discuss the mechanism of biological phosphorus removal process . 4. Draw and describe the operation of any phase of activated sludge system</p>		
Work placement	Not applicable		