



Subject card

Subject name and code	, PG_00037596						
Field of study	Green Technologies and Monitoring						
Date of commencement of studies	October 2019	Academic year of realisation of subject			2022/2023		
Education level	first-cycle studies	Subject group			Optional subject group Subject group related to scientific research in the field of study		
Mode of study	Full-time studies	Mode of delivery			at the university		
Year of study	4	Language of instruction			Polish		
Semester of study	7	ECTS credits			3.0		
Learning profile	general academic profile	Assessment form			assessment		
Conducting unit	Department of Colloid and Lipid Science -> Faculty of Chemistry						
Name and surname of lecturer (lecturers)	Subject supervisor		dr inż. Ilona Kłosowska-Chomiczewska				
	Teachers		dr inż. Ilona Kłosowska-Chomiczewska				
Lesson type and method of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	0.0	15.0	0.0	0.0	45
	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	45	3.0		27.0	75	
Subject objectives	The aim of the course is to familiarize students with the technologies used in water treatment for consumption and industrial purposes						
Learning outcomes	Course outcome	Subject outcome			Method of verification		
	[K6_W04] is aware of the importance of environmental protection and has a basic knowledge of chemical and biological threats to the environment, with particular emphasis on anthropogenic factors, has a basic knowledge of knowledge of the principles of sustainable development as well as national and European environmental management conditions.	Student is aware of the need to treat water intended for consumption and industrial use, indicates water pollution and describes the methods of their elimination, allowing to meet the requirements of consumers (including various industries) and legal requirements			[SW1] Assessment of factual knowledge		
	[K6_W03] has a basic knowledge of soil, air and water pollutants, design and supervision of environmentally friendly technologies and technologies which do not produce waste, knows technology of cleaning and neutralization of industrial waste and wastewater management, has a basic understanding of the theoretical basis of methods and types of apparatus used in chemical analysis of environmental pollutants	Student knows what the meaning is proper water preparation and is able to propose appropriate methods of her treatment			[SW1] Assessment of factual knowledge		
	[K6_U05] can formulate and solve engineering tasks analytical methods, simulation as well as experimental, able to apply knowledge of basic physics and mathematics to analyze the results of experiments, is able to analyze and assess existing technical solutions	Student describes the technologies related to water treatment to drinking and industrial purposes, can propose several technologies and choose the most suitable based on for extensive knowledge			[SU2] Assessment of ability to analyse information [SU3] Assessment of ability to use knowledge gained from the subject		

Subject contents	Water quality requirements for drinking purposes. Quality of surface waters intended for supplying the population with water for consumption. Ways of minimizing water consumption (closed circuits, water-saving devices etc.) Methods of water intake and transfer. Water purification using natural and artificial infiltration. Basics of water treatment processes and technologies: mechanical-physical (sedimentation, filtration, degassing or aeration), physical-chemical (coagulation, precipitation, oxidation, ion exchange, desalination). Water disinfection (thermal method, ultrafiltration, radiation, chlorination, ozonation and others). By-products of water treatment and their influence on water quality. Membrane techniques in water treatment (reverse osmosis, ultrafiltration, nanofiltration, electrodialysis). Water restoration. Sorption on active carbon. Selection of water treatment technologies depending on water source (surface, underground, sea, mine) and its destination. Modern solutions of water treatment processes, including those for energy purposes.		
Prerequisites and co-requisites			
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	lab tests and reports	60.0%	40.0%
	exam	60.0%	60.0%
Recommended reading	Basic literature	Pal, Parimal. Industrial water treatment process technology. Butterworth-Heinemann, 2017. Spellman, Frank R. Handbook of water and wastewater treatment plant operations. CRC press, 2008.	
	Supplementary literature	Faust, Samuel D., and Osman M. Aly. Adsorption processes for water treatment. Elsevier, 2013. Sanks, Robert L. Water treatment plant design for the practicing engineer. Ann Arbor Science Publishers, 1978. Harland, Clive E. Ion exchange: theory and practice. Vol. 6. Royal society of Chemistry, 1994. Johnson, Evan C., and William M. Adams. "Water intake, body water regulation and health." (2020): 702.	
	eResources addresses		
Example issues/ example questions/ tasks being completed	When and why it is necessary to remove iron from water? Suggest two ways to remove iron. What is the principle of degassing water by physical methods? Describe one of the chemical removal methods selected. What do you know about the use of ion exchangers in the water treatment process? Water disinfection with chlorine.		
Work placement	Not applicable		